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Small Shop Secures Low Costs

Aluminum Shop Built for Economical Production — Drags for Crankcase Castings Molded on a Jar-Ram Rollover Machine and Copes Are Made on a Pattern Board

BY H. E. DILLER

OVER since the formation of the Steel corporation in 1901 the tendency of the metal working industry has been more and more to consolidate and increase the size of production units. Recently efforts have been made to merger the smaller independent steel companies to secure the economical advantages of vast resources and shipping points in the centers of the various steel consuming regions of the country. In the foundry field the tendency to consolidate has been less marked, but the drift toward larger units has been decided. Many companies with a daily capacity of more than 100 tons are operating either in single foundries, or in a number of

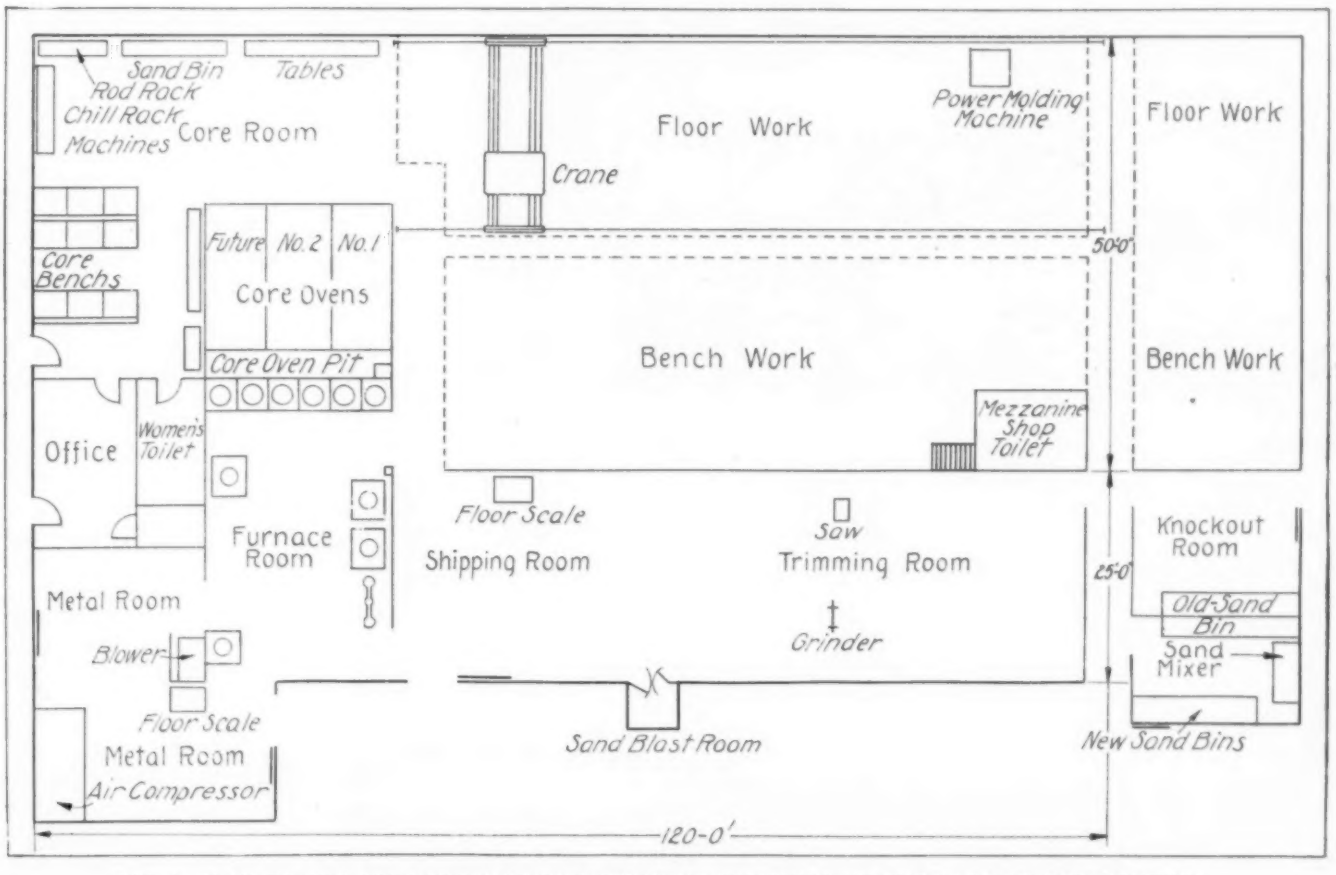


FIG. 1—PLAN OF THE SHOP SHOWING THE RELATIVE POSITIONS OF THE VARIOUS DEPARTMENTS

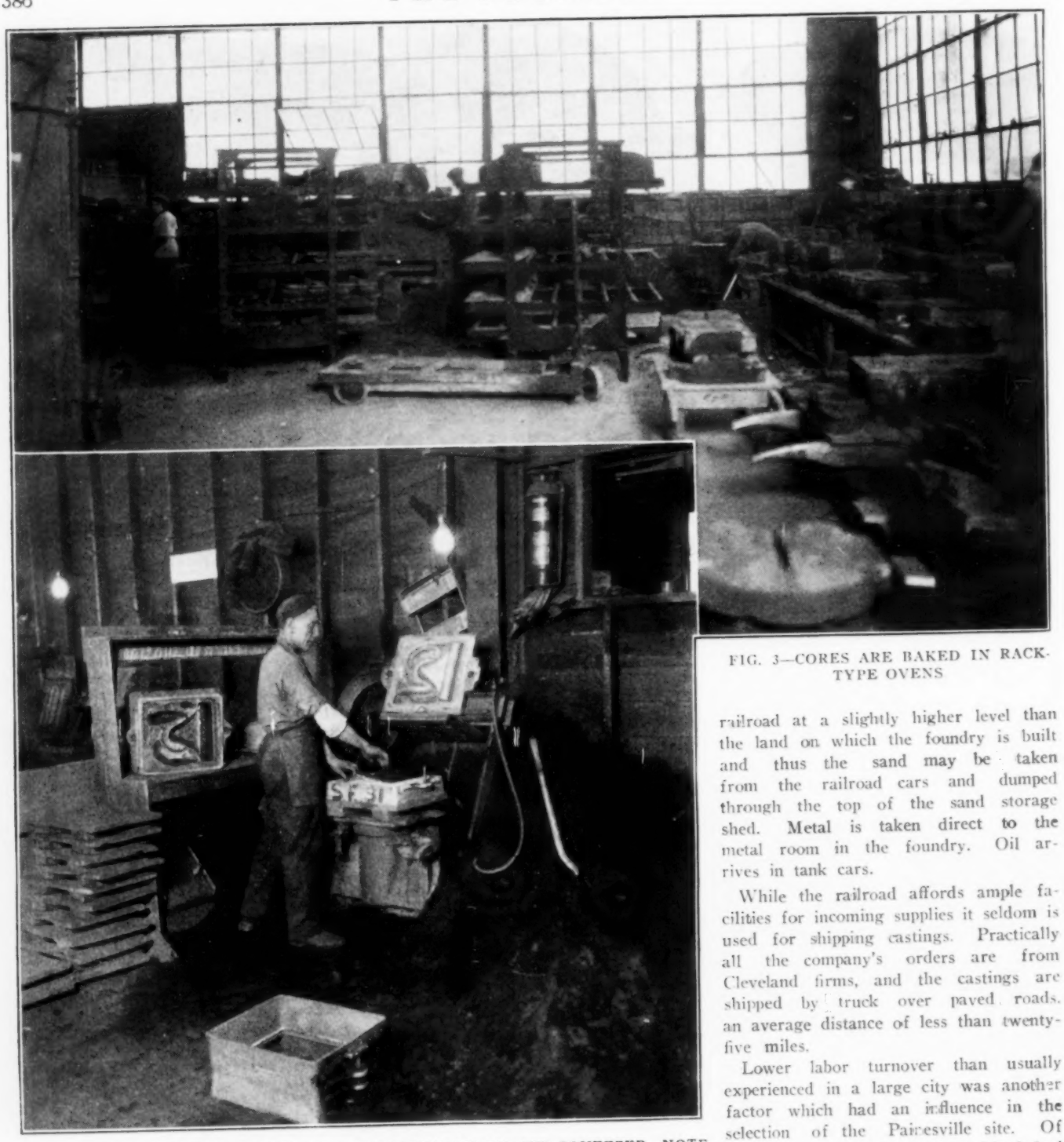


FIG. 2—VACUUM CLEANER CASTINGS ARE MADE ON AN AIR SQUEEZER—NOTE THE SIDES OF THE FLASKS SLOPE TOWARD THE PARTING LINE

FIG. 3—CORES ARE BAKED IN RACK-TYPE OVENS

branch plants which are strategically located.

However, many small foundries still thrive and maintain their position in competition with the larger manufacturers. Because of their comparatively cheaper melting equipment and the ability to melt economically in smaller units the brass and aluminum foundries are able even better than the steel and gray-iron shops of small capacity to produce at cost comparable to those of the larger shops. Many of these shops now are working to capacity and have been doing so for some time, even under the recent business conditions when foundries in general were working only part time with greatly reduced forces.

A study of how this is done by The Light Alloys Co., Painesville, O., therefore should be of interest to the man who is operating or contemplating the operation of a small foundry. Location and how to keep down overhead expense were the first factors considered in starting this plan. A site for the foundry was secured at the northwest corner of the intersection of the tracks of the Baltimore & Ohio and New York Central railroads. The plant is served by a siding from the Baltimore & Ohio railroad at a slightly higher level than the land on which the foundry is built and thus the sand may be taken from the railroad cars and dumped through the top of the sand storage shed. Metal is taken direct to the metal room in the foundry. Oil arrives in tank cars.

While the railroad affords ample facilities for incoming supplies it seldom is used for shipping castings. Practically all the company's orders are from Cleveland firms, and the castings are shipped by truck over paved roads, an average distance of less than twenty-five miles.

Lower labor turnover than usually experienced in a large city was another factor which had an influence in the selection of the Painesville site. Of course, nearly every employe hired had to be taught how to do his work, but an efficient force soon was organized. Overhead is kept down through the method of organization and plant upkeep.

To start the plant the smallest size standard building designed by the H. K. Ferguson Co., Cleveland, was erected with one side wall and an end wall built in permananent construction with concrete blocks and steel sash. The other walls were built of steel frame to provide for future expansion. The original building covers the area 50 x 120 feet shown in the upper left hand corner of Fig. 1, together

with the extension including the furnace and metal rooms built of permanent construction, and the 25-foot wide leanto in which the shipping and trimming rooms are located. Later the 25-foot leanto on the right end was added to provide more molding space and to house the knockout and sand-mixing rooms. In future extension the end leanto will be swung around in line with the one at the side, and the foundry will be continued from the end, keeping the side wall of permanent construction. In addition to the building shown in Fig. 1, a small frame building houses the acetylene generator. The temporary shed used by the builders for an office and to house building materials, has been converted into a pattern shop where patterns are repaired.

A study of the layout will furnish a clear idea of the operation of the shop. The core department is located beside the office, in the corner of the building. It is equipped with benches for nine coremakers and with two hand rollover core machines built by the International Molding Machine Co., Chicago. The machine is used for the production of the larger cores. Both men and girls are employed on the benches. Cores are dried in two single-ended rack-type ovens and one of the drawer type built by the Foundry Equipment Co., Cleveland. A foundation for a third rack-type oven has been laid. These ovens are all oil-fired from a pit in the rear. Each oven holds two racks which are handled with a hand-lift truck. This with some of the racks may be seen in Fig. 3 which is a general view of the core department. The ovens are fired steadily during the day and before quitting time they are filled with cores and the burners are turned off. The residual heat of the oven dries the cores so that they may be taken out the following morning ready for the molds.

Sand Brought in at Night

Sand is brought to the benches in wheelbarrows from the sand-mixing room at the opposite corner of the building. Nearly all this work is done by the night watchman. New sand is thrown into the bin from the outside through trap doors and is shoveled out of the bin through openings at the floor level. A bin 3½ feet high between the knockout room and the sand-mixing room serves for the used sand. The core sand which is knocked from the castings is thrown on a screen which covers the sand bin in the knockout room. The fine sand falls through to the bin and the larger pieces roll off the screen to the floor of the knockout room toward which the screen slopes. It is then carried to the dump for which the company has ample land. Sand is shoveled from this bin as from the one containing new sand. All sand for cores is mixed in a machine built by the Standard Sand & Machine Co., Cleveland. Local lake and bank sands are used for cores. The molding sand is secured from the region around Conneaut, O.

Floor and Bench Work Separated

Molding work is divided into two sections separated by an aisle shown in Fig. 1. At present seven air speezers are used in the bench-work department and the floor work is nearly all made on a jar-ram machine with a power rollover pattern-draw attachment, built by the International Molding Machine Co., Chicago. This floor is served by a 1-ton traveling crane with an 80-foot runway and 22-foot span built by the Euclid Crane & Hoist Co., Euclid, O.

Operations involved in making a crankcase for a six cylinder automobile engine are highly interesting, showing how work can be co-ordinated to produce good results.

The method of making the drag clearly is illustrated in Fig. 8 which shows a drag rolled over and the pattern plate partly swung back into position. After the pattern plate is returned to a horizontal position the two molders working on the drag lift a flask in place and clamp it firmly to the plate with *C* clamps and wedges. Aluminum flasks are used on this machine. These are firmer and more rugged than wooden flasks, and the metal has a high salvage value when the flasks become too badly worn.

After the flask is clamped, one molder draws the four horn gates from the drag previously made by engaging a lug on each gate pattern with a hook, catching it by two holes drilled in each side. These gate patterns may be seen at the left near the end of the flask in Fig. 8. The position of two of them in relation to the pattern is shown at *A*, Fig. 6, which illustrates a casting after it has been taken from the mold. The molder who draws the gate patterns also slicks the mold where necessary. In the meanwhile the second molder has dusted parting over the mold, and set the denseners, or chills as they are sometimes called, and the gate patterns as well as one ramup core which forms a pocket in the gear housing. In all 11 denseners are used, being placed on heavy sections where they join lighter ones to cool the heavy section more rapidly and cause it to set quickly, thus preventing it from cracking. One of the denseners in an arm of the crankcase may be seen at B, Fig 8. The four holes shown in this densener are countersunk and when filled with sand serve to hold it in its place more firmly. Other denseners are anchored in the sand by nails cast partly in them. Usually aluminum denseners are used, but in some places in the drag, iron denseners are employed on account of their greater weight which keeps them from rising.

The molders then riddle some sand on the pattern and tuck it with their hands under the gate patterns. This

FIG. 4—TEMPERATURE READINGS ARE TAKEN OF THE METAL BEFORE IT IS SENT TO THE MOLDING FLOOR

FIG. 5—COPES ARE LIFTED OFF THE PATTERN BOARD AND SET ON EDGE ON HORSES, FOR FINISHING

is repeated, then the flask is shoveled more than half full of sand and jolted. Sand is rammed under the horn gates and around the edges of the mold, and the flask is filled with sand which is rammed with the butt end of the rammers. The sand is struck off, a bottom board attached and the flask rolled over. After the clamps have been taken off the pattern is drawn by power while using an air vibrator. The crane electrically operated picks up the drag by means of the four-hooked attachment shown in both Figs. 6 and 8 and carries it to its appointed place on the floor near the aisle.

Cores are brought to the drag on trays carried by two men, and placed in a convenient position for the molder who sets them in the mold. Fig. 7 shows part of this row of drags, with the cores at one drag ready for the core setter. In the drag, part of which is shown in the foreground, the cores have been set. Sixteen small trimming cores including 12 for forming the holes for the push rods are set first. The prints for these cores may be noted on the pattern, Fig. 8. Next the arm cores, two on each side of the gear-case housing and one in each arm of the fly-wheel housing, are set. Cores for the fly-wheel housing and the gear case are next located. The two body cores, each forming three holes for the cylinders are placed. Both of these cores have two prints as may be seen from the pattern, Fig. 8. A magneto core and a core for forming the bracket of the pump are set at *C* and *D*, respectively, Fig. 8. Three small semicylindrical bearing cores finish the drag. These cores are made of aluminum in the form as a semicylinder bound together with dried sand, and thus act as deseneers. The sand allows the core to give as the metal shrinks.

While the drags are being made, copes are molded in the space between the line of drags and the wall. The pattern board is placed on two low horses as indicated in Fig. 5. The two molders who work on the cope then set the flask on the board, one dowel pin in the flask fitting in a hole on the board, flanged with a steel collar, and a dowel in the other end of the board fitting in a lug on the flask, carefully machined to make each cope fit any drag flask. Six riser sticks are placed, two in the center and two near each end, and the two gate sticks are set, one on each side. The gates and risers may be noted in Fig. 6. One man then riddles sand while another molder sets the densers and places gaggers where needed.

The sand is tucked well around the riser and gate sticks and then more sand is shoveled into the flask. This is rammed around the gate and riser sticks and under the flask bars with the shovel handles and the flask is filled with sand. One man tramps this sand with his feet, while the other molder finishes the cope previously made. When the sand is rammed, six men of the gang lift the flask off the board, setting it on its side on two horses standing behind the board, and the board is moved opposite the next drag. The cope shown in Fig. 5 has been set on the side opposite to where it is usually placed, to secure better light for the photograph. The workmen who lifted the cope then close the cope on the next mold.

After the cope is clamped with four extension clamps the mold is ready to pour. Two bull ladles, each holding 100 pounds of No. 12 alloy are used. The down gate on each side leads through a runner to two horn gates. The ladles are held a foot or more above the mold and the metal enters in a full stream, filling the mold rapidly. This action carries the scum and gases up through the risers, keeping dross from settling in the casting. Immediately the casting has set, the cope is lifted by the crane to the side of the wall and the sand is dumped. The drag is carried to the floor on the oposite side of the molding machine where it is dumped. Two men cut the sand for the drags, besides knocking the molding sand from the casting and setting it on a truck to be taken to the knockout room. The mold and casting are handled with the attachment shown in Fig. 6. This consists of two double pronged hooks attached to a ring on the chain hook. The stem on this casting, shown at *E*, is a sand trap. A hole is made in the mold with the end of one of the tools, then when the mold is blown for cleaning, sand driven into this corner will settle in the hole and remain clear of

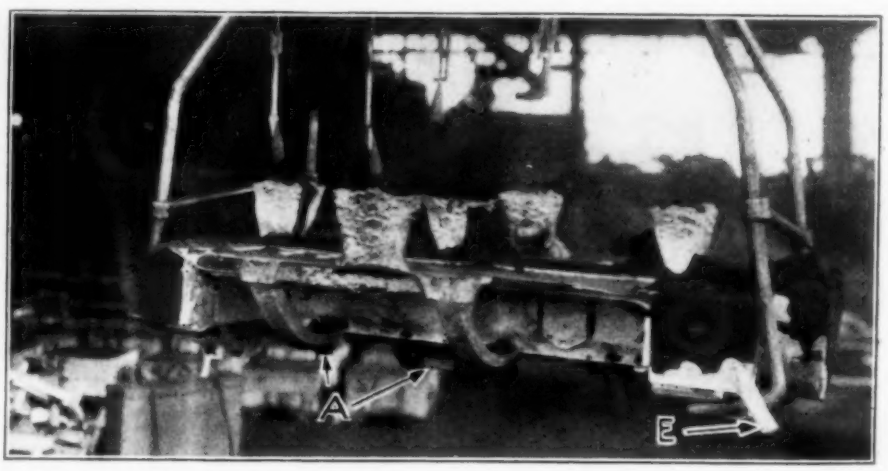


FIG. 6—CASTINGS AS WELL AS FLASKS AND MOLDS ARE CARRIED BY GRAB HOOKS ATTACHED TO THE CRANE

the casting when the mold is filled.

The smaller castings are made on power squeeze machines in the usual manner, except that a specially designed and patented flask is used. This is illustrated in Fig. 2, which shows the mold for a vacuum sweeper casting. The particular feature about the flask is that in both the cope and the drag all four sides slope toward the parting line. This construction with ½-inch sand strip around the parting line of both sections prevents the sand from sagging in the centers. A match plate with part of the pattern on each side is used. The illustration, Fig. 2, shows the cope taken off and setting on the side bench at the left. The pattern which has been drawn is standing on the squeezer head, and the two cores forming the vacuum chamber and the outlet pipe have been set in the drag. This casting is poured rapidly from one down gate, and a riser is placed on the opposite side. The illustration shows a fire extinguisher on the frame partition between the molding department and the finishing room.

While other partitions in the shop are of lumber the wall of the furnace room is built of brick and tile to make it fireproof. This room as may be noted from Fig. 1, adjoins the molding department. Metal is melted in six oil-fired, open-pot furnaces each of 280 pounds capacity, built by the Foundry Equipment Co., Cleveland, and two tilting furnaces furnished by the Monarch Engineering & Mfg. Co., Baltimore. No. 12 alloy which is generally used consists of 8 per cent copper and 92 per cent aluminum. The copper cannot be introduced directly into the melted aluminum, so a hardening alloy must be made. This is done by melting copper in a tilting crucible furnace and pouring it into an equal weight of aluminum melted in an open-pot furnace.

The Light Alloy Co., lays great stress upon the necessity of pouring every casting at the correct temperature. An indicating pyrometer is provided so the melter can determine the temperature of the metal when it becomes red hot. The first reading usually will be so close to the temperature desired that the melter can estimate the time required to raise the metal to the correct temperature. When this temperature is indicated the oil is turned off and the metal is dipped or poured into bull ladles to be carried to the molding floor. These ladles first are heated as a cold ladle would cool the metal too fast. Before the metal is carried to the molding floor a temperature reading is taken while the ladle stands in the doorway as shown in Fig. 4. Should the metal be a little cool for one casting it is poured into a mold requiring a lower-temperature metal and the metal in the furnace is heated further. It is seldom too hot as excess temperature carefully is avoided. When a pattern is received the correct temperature for pouring the mold is determined by trial and the temperature decided upon is adhered to for all castings made from that pattern.

FIG. 8—DRAGS FOR CRANKCASE CASTINGS ARE MADE ON A JAR-RAM POWER ROLLOVER MACHINE

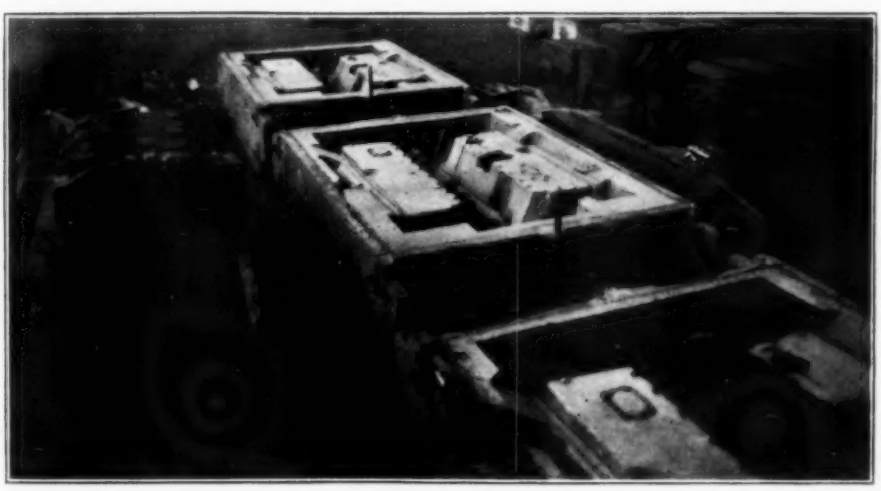


FIG. 7—DRAGS ARE SET ON THE FLOOR IN A ROW AND CORES ARE CARRIED TO THEM ON TRAYS

The cleaning department includes a sandblast room equipped by the Pangborn Corp., Hagerstown, Md. A band saw for removing gates and risers and a two-wheel grinder for trimming the castings, also are provided. An air compressor furnished by the Gardener Governor Co., Quincy, Ill., suplies compressed air for the molding machines, sand blast and pneumatic tools. Air for the furnaces is secured from a blower built by the P. H. & F. M. Roots Co., Connersville, Ind.

The inspector is assisted in tracing trouble by the date molded on every casting showing when it was cast. Every day, date stamps of aluminum are cast for the following day and one is given to each molder with which to mark every mold he makes. Then in case of defective castings it can be determined whether all were cast the same day, or whether they were equally distributed over a number of days.

Carburize Synthetic Cast Iron

Experiments Made in Introducing the Commercial Forms of Carbon—Details of Operations and Results Outlined—Effects of Slags and the Various Elements Contained in Iron Are Studied

BY CLYDE E. WILLIAMS AND C. E. SIMS

THIS study of carburization in the manufacture of synthetic cast iron was carried on because of the lack of definite information regarding the factors which influence carburization. Steel scrap in the form of turnings, punchings, and clippings comprised the melting stocks.

The following studies were conducted with the hope of determining some of the factors that influence the carburization of iron in making synthetic cast iron. They first were made in a small 2-electrode pit-type furnace, which held about 50 pounds of metal and took an input of about 50 kilowatts. The cross section of the crucible was 9 by 15 inches. Three-inch square graphite electrodes were used. The furnace was first lined with magnesite brick and the bottom and sides then faced with magnesia-alumina spinel containing 2.5 parts dead-burned magnesia and one part alundum. The power input to this furnace corresponds to 2000 kilowatts per ton of metal, or 50 kilowatts per square foot of hearth area.

Realizing that this furnace was overpowered, a larger furnace was constructed and used in repeating the experiments performed in the 50-pound furnace. The larger furnace was of the roofed, tilting type. It held 300 pounds of metal and took power at the rate of 75 to 100 kilowatts. The hearth was lined with magnesia brick and covered with magnesia-alumina spinel. The sides and roof were made of corundite brick, a highly aluminous fire clay, experience having shown that this brick gave more satisfactory results than silica brick. The cross section of the hearth was 17 x 24 inches. Two 3-inch round graphite electrodes were used. The power input corresponds to about 600 kilowatts per ton of metal, or 35 kilowatts per square foot of hearth area. When the furnace was preheated to about 400 degress Cent. 1000 kilowatt-hours per ton was required for melting and carburizing to 3.5 per cent carbon. Considering its small size, it would seem that the furnace was not overpowered to a large degree. The power factor was about 96 per cent during all of the experiments.

The electrode consumption was at the rate of 11 pounds per ton of iron. Part of this consumption was due to oxidation of the electrode at the roof, since no cooling rings were used.

Paper presented at the general meeting of the American Electrochemical society held in Baltimore, April 27 to 29.

Problem Well Studied

ELECTRIC furnaces as applied to the gray-iron foundry appear to have two distinct fields; the one as an adjunct to the cupola and the other for producing synthetic gray iron from the cheaper forms of steel and iron scrap. In this latter process it is essential to introduce readily the correct amount of carbon. This has presented some difficulties. Therefore, the results of the studies of this subject made by Messrs. Williams and Sims, having the resources of the U. S. Bureau of Mines at their disposal, is of vital interest to those engaged in or contemplating the production of synthetic cast iron.

Commercial Forms Employed

To determine the relative values of the various carburizers, most of the commercial forms of carbon were employed for comparison. The list includes graphite, resistor carbon, charcoal, coal-tar coke, low-ash coke, high-ash coke, silicon carbide, calcium carbide, and a lime-coke mixture to stimulate formations of calcium carbide. No anthracite coal was available.

The experiments cover many runs both in the small pit furnace and in the larger tilting furnace. For the work in the pit furnace mild steel turnings were used as the raw material. This material is similar to that used by Keller in making synthetic cast iron. Fifty pounds of turnings per charge were used in all of the runs. In all tests the carburizer was crushed to pass a 10-mesh screen.

Before charging, the furnace was preheated to a red heat. The order of charging was as follows: About 20 pounds of the charge, consisting of alternate layers of steel turnings and carburizer, was put in the furnace. The current was then introduced, and the remainder of the charge added as rapidly as melting progressed. When the entire charge was melted, a sample for chemical analysis was ladled out and poured into a graphite mold 1-inch square and 1½ inches long. Some of the metal was also poured on the concrete floor and covered with diatomaceous earth to prevent chilling. This latter piece was later broken and its fracture examined. Samples for analysis and fracture were taken every 10 or 15 minutes and when the fracture showed no further change, it was assumed that conditions had approached equilibrium and the charge was tapped.

In many of the runs in which the carburizer was added with the cold metal, the first sample taken after the charge was molten contained over 3 per cent carbon. Therefore, to investigate the rate of carburization in the lower concentrations of carbon, it was necessary to melt the turnings in the absence of the carburizer, and then, after the first sample had been taken, to add the carburizer to the surface of the molten metal. It was more difficult to melt the steel turnings without the carburizer than with it, due to the relatively higher melting point of steel. The ferroalloy and other additions were usually made with the first portion of the turnings, but at times they were made after the metal had been melted.

Always Added in Excess

The carburizer was always added in excess of the amount theoretically necessary; usually it amounted to about 10 or 12 per cent of the weight of steel turnings. In such a small furnace it was found to be a distinct disadvantage, to have too thick a layer of carburizer on the surface of the melt, because the current would be carried through the carburizer without directly heating the metal. Hence, a layer of carburizer about ½ inch thick was kept on the surface, making sure, however, that there were no bare spots of metal exposed.

For experiments in the larger furnace, steel scrap in the form of boiler punchings and clippings was used, instead of the less pure steel turnings. The boiler punchings and clippings carried in size from 1 to 10 inches, were uniform in composition, and contained 0.05 per cent sulphur and phosphorus, 0.5 per cent manganese, 0.5 per cent carbon and 0.2 per cent silicon.

A charge in the large furnace consisted of 300 pounds of steel scrap and about 20 pounds of carburizing material. The

furnace was preheated by placing a piece of electrode in the bottom and drawing an arc on it. Then about 200 pounds of the steel scrap and 10 pounds of the carburizer were charged, the carburizer being placed so that some of it rested between the pieces of steel and some lay on top acting as a cover. The furnace was operated by direct arcing, and when most of the charge had melted an additional 100 pounds of steel scrap was added. The rest of the carburizer was added at intervals. The addition of ferrosilicon and other alloying material was made just before the metal was entirely melted.

The electrodes were controlled by means of a drum and worm gear operated by hand. In order to insure arcs of equal intensity on both electrodes, two ordinary incandescent lamps were placed on a shelf near the meter board. These had a common connection to the metal bath and each a seperate connection to one electrode. Thus, the brilliancy of the filament of each lamp was proportional to the voltage drop between the bath and the electrode to which that lamp was connected. This arrangement provided a sensitive and convenient means of regulation, assured smooth electrical operation, and thus made comparable the results obtained in the various runs.

The temperature of the bath of metal was taken at intervals throughout each run. An optical pyrometer made by the Leeds-Northrup Co., Philadephia, was used, two readings being taken by sighting first upon freshly-exposed metal and next upon the carburizer. These two readings checked closely. The temperature was maintained fairly constant throughout all of the runs. It ranged between 1350 degrees and 1450 degrees Cent. and was seldom higher or lower. Integrated temperatures for the various runs were not usually more than 50 degrees apart.

The experiments performed in the 50-pound furnace were repeated in the 300-pound furnace. In all 78 individual melts were made. Conclusions have been drawn from the results obtained in all of these tests. All the data cannot be reproduced here, and therefore, only results of the typical runs are shown.

The curves in Fig. 1 show the rates at which different forms of carbon are absorbed in molten iron and the relative values of these varieties of carbon as carburizers. The dotted portion of any curve is indefinite and covers the melting period. The carburization between 0.5 and 2.5 per cent carbon has been largely ignored in this investigation for the reason that, throughout this range, absorption is so rapid that no appreciable difference in the various materials could be found. This is illustrated in Fig. 2. In these runs the metal was melted in the absence of carbon and then graphite and charcoal, respectively, were introduced. In each case the carbon in the iron increased from 0.8 per cent to 2.7 per cent within 10 minutes. These were 50-pounds charges, melted in the small pit furnace.

Rate of Solution Rapid

The tests just described and other similar ones show that the rate of solution of carbon in molten iron is rapid, but naturally diminishes as the saturation point is approached. Furthermore, observations seem to indicate that carburization during the melting-down period is accomplished, not in the solid iron phase, but in the liquid iron as it gradually forms and mixes with the carbon which at first is present in large excess. Results in the experiments here described have shown that there is little difference in the amount of carbon introduced whether melting small steel turnings or comparatively large boiler plate clippings. The extreme slowness of the peneration of carbon in the cementation process is well known. It is, therefore, very probable that in making synthetic cast iron most of the carburization takes place after the steel has melted.

Comparison of the different varieties of carbon showed as follows:

Graphite—A grade of granular resistor graphite was used in the tests. Graphite always gave a rapid rate and a high degree of carburization, in practically every case excelling all the other forms of carbon. The superiority of graphite over granular resistor carbon or coal-tar coke, which is similar to petroleum coke was not great. Curbe *B*, Fig. 1, shows the carburization curve for graphite. The steep pitch of the curve and the high percentage of carbon obtained are particularly noticeable. The high apparent density of graphite undoubtedly assists it in obtaining good contact with the metal; its low ash content also unquestionably improves its carburizing power as is later brought out more fully.

Charcoal—Curve *D*, Fig. 1, shows the rate of carburization using charcoal in the large furnace. Much lower absorption of carbon is shown here than in the charcoal curve in Fig. 2, which was obtained from a test in the small pit furnace. There was much better contact between the charcoal and the metal in the small furnace than in the large one. All the tests have shown that good carburization is possible only when good contact between the charcoal and the metal is obtained. Because of the light, porous nature of charcoal there is much difficulty in keeping it in good contact with the molten iron, especially near the arc or in the presence of a slag. The layer

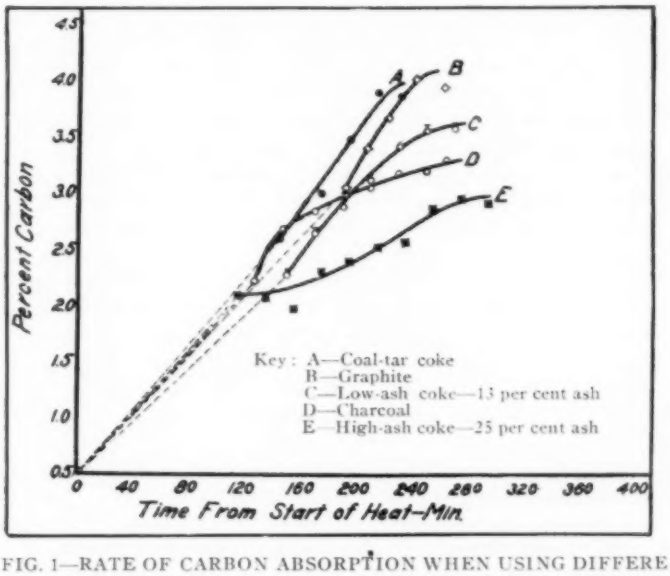


FIG. 1—RATE OF CARBON ABSORPTION WHEN USING DIFFERENT FORMS OF CARBON—SILICON ABOUT 2 PER CENT; OTHER IMPURITIES LOW

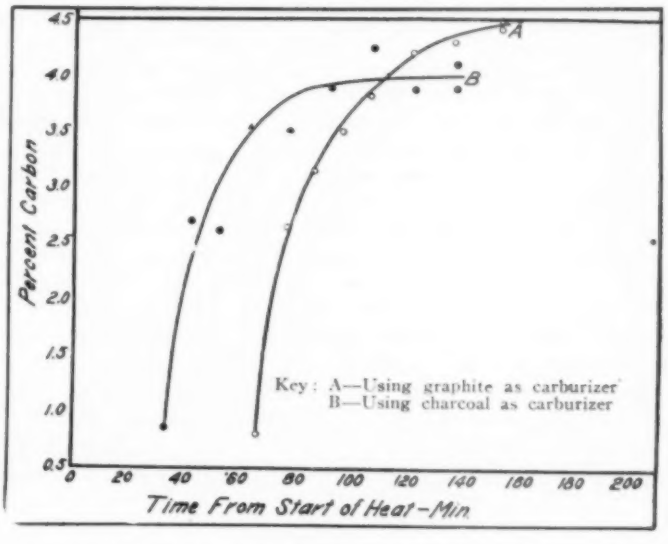
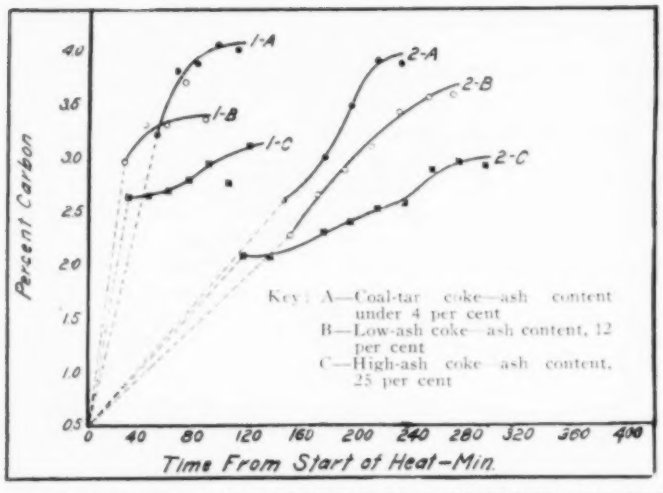


FIG. 2—RATE OF CARBON ABSORPTION AT LOWER CONCENTRATION OF CARBON—TESTS MADE IN SMALL FURNACE ON IRON CONTAINING 2 PER CENT SILICON



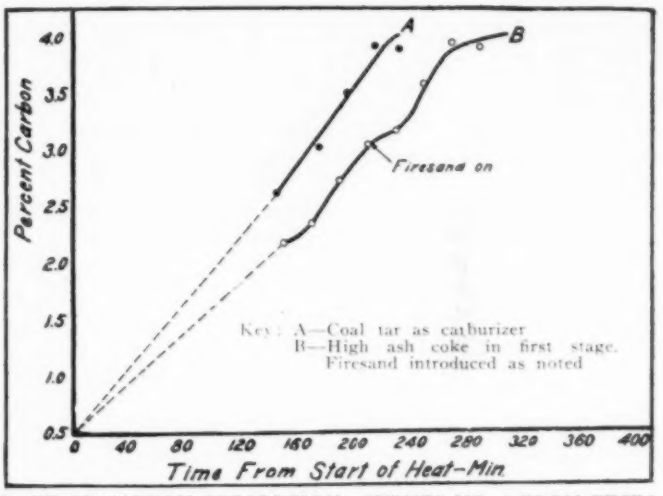


FIG. 3—EFFECT OF ASH CONTENT OF CARBURIZERS ON THE RATE OF CARBON ABSORPTION—CURVES NO. 1 FROM TESTS IN 50-POUND PIT FURNACE—NO. 2 IN 300-POUND ROOFED FURNACE FIG. 4—RELATIVE RATE OF CARBON ABSORPTION WHEN USING COAL-TAR RESIDUE AND CARBORUNDUM FIRESAND

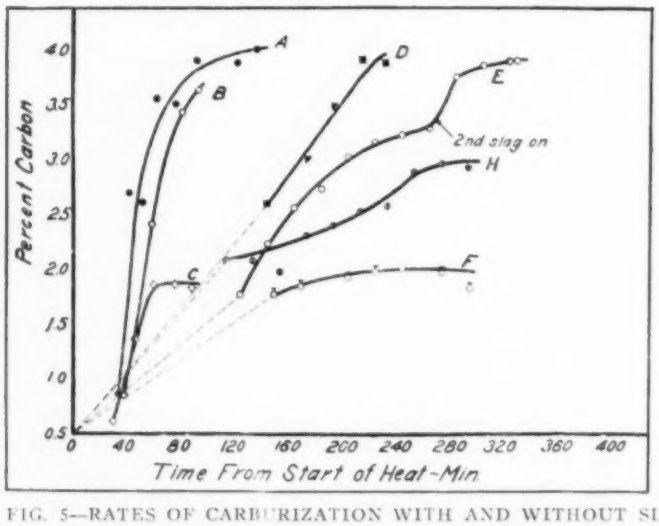
of charcoal on the bath should not be so thick as to prevent the arc from penetrating to the metal. In some types of furnaces, notably the pit type furnace working continuously, charcoal should give satisfactory results.

Coal tar coke and granular resistor carbon—The coal tar coke, made by the distillation of coal tar, was obtained from a local creosoting plant, and contained from 7 to 8 per cent volatile matter and less than 4 per cent ash. It is similar to petroleum coke and any reference made to it should apply equally to petroleum coke. Curve *A*, Fig. 1, shows that coal-tar coke gives excellent carburization, more nearly approaching grahite than anything else that has been used. Fig. 3 shows a comparison of coal-tar coke with some other cokes. Granular resistor carbon containing 5 per cent ash has given results similar to those obtained with the coal-tar coke.

High-ash coke—During the early experiments a high-ash coke was used for carburizing with consistently poor results the maximum carbon content obtained in the iron being a little over 3 per cent. This coke was so noticeably inferior that an investigation of the reason was undertaken. Analysis showed that the coke contained 25 per cent ash, and it was suspected that the trouble was due to this high ash content. Further experiments unquestionably proved that the high ash was the cause of the inferiority of the coke. A coke containing 13 per cent ash gave much better carburization than did the 25 per cent ash coke, but poorer carburization than did the lower ash coal tar coke. Fig. 3 shows the relative rates and degrees of carburization obtained with these cokes.

Results obtained in the small and in the large furnace are shown. These curves illustrate the detrimental effect of ash, and show that the absorption of carbon decreases as the ash content of the carburizer increases. The ash being a component part of the structure of the coke probably acts as a protective coating on the carbon, serving to keep it from intimate contact with the metal, this effect being intensified as the carbon dissolves and the relative amount of ash becomes larger. Graphite resistor carbon, coal-tar coke, petroleum coke, and charcoal should be desirable carburizers because of their low ash content. Of these, the denser varieties should be preferred.

Silicon carbide—Experiments with carborundum firesand (an impure silicon carbide) proved it to be an efficient means of introducing both silicon and carbon into iron. Inasmuch as the proportion of silicon to carbon in silicon carbide is roughly 2 to 1, it cannot be used for introducing all of the required carbon because too much silicon would result. It would also be too expensive for this purpose. However, its cost for introducing silicon would almost equal that of ferrosilicon and it would have added advantage of effecting some car-



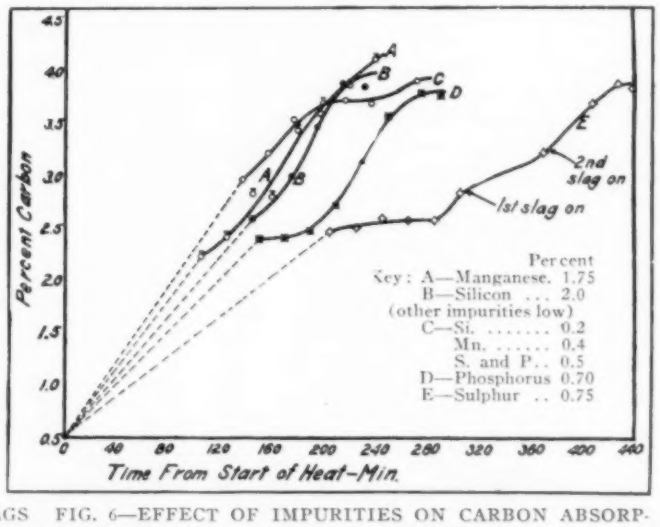


FIG. 5—RATES OF CARBURIZATION WITH AND WITHOUT SLAGS FIG. 6—EFFECT OF IMPURITIES ON CARBON ABSORPTION—2 PER CENT SILICON IN ALL SAMPLES EXCEPT C—MANGANESE, SULPHUR AND PHOSPHORUS ARE LOW EXCEPT AS INDICATED IN KEY

Key: A—Run in small furnace using charcoal alone. B—Run in small furnace using coke and a lime-fluorspar slag. C—Run in small furnace using calcium carbide and a fluorspar slag. D—Run in large furnace using coal-tar coke alone. E—Run in large furnace using high-ash coke and a lime-fluorspar slag. F—Run in large furnace using coke and silica-alumina slag. H—Run in large furnace using high-ash coke alone.

burization. Fig. 4 shows the results of a test in which a high-ash coke and silicon carbide were used in conjunction. The scrap steel plate was melted with a cover of the coke and held molten for an hour. Previous experience had shown that after an hour there would be practically no further absorption of carbon from this coke. At this point, indicated by the arrow on the curve, carborundum firesand was thrown on the melt, with the result that the absorption of carbon continued rapidly until 3.9 per cent carbon had been reached. Carbon and silicon were taken up by the iron in the ratio of 0.8 per cent carbon to 1.55 per cent silicon, which is very close to the proportion of carbon to silicon in silicon carbide. Assuming that the carborundum firesand contains 75 per cent silicon carbide, the recovery in the iron of this siliconcarbide as silicon and carbon was 75 per cent.

In most cases it may be noticed that the last point in the curve is slightly lower than the preceding point. The last point is taken from the analysis of the pig sample, and other points are taken from the analysis of the samples obtained in the graphite mold. Due to the slow rate of cooling of the pigs, those which contained large amounts of silicon or carbon ejected graphite as kish and hence contained less carbon than their equivalent samples which were cast in small molds, and therefore cooled too rapidly to permit the formation of so much graphite. The difference ordinarily amounts to about 0.1 per cent carbon.

Effect of Slags

In general all of the tests have shown that slags interfere with carburization. This interference is due to the physical effort of the slag in preventing contact between the carburizing material and the metal. Therefore, in the tests unless the effect of the slag was being particularly considered, the surface of the metal was kept as free from slag as possible. The effect of high-ash coke has already been discussed—see Fig. 3. The ash from this coke consists essentially of alumina and silica. Curve *F*, Fig. 5, shows the effect of a high silica-alumina slag upon carburization with low-ash coke (coal tar coke). This slag was accidentally introduced by the fusing of part of the furnace lining. Results of other tests indicate the retarding effect of siliceous slags upon carburization.

High-lime slags have practically the same effect due to the physical action of tending to prevent contact. However, if conditions are right for the formation of calcium carbide, lime may aid carburization. Curve *B*, Fig. 5, shows the results of tests with low-ash coke and a lime slag. Calcium carbide was formed by the arc, thus causing rapid introduction of carbon into the iron. In another test using calcium carbide and carbon, carburization was still more rapid. Curve *C* is taken from an experiment in which calcium carbide alone was used as the carburizer. The carbon content of the iron increased rapidly and then stopped. Only 50 per cent efficiency of the carbon in the carbide was obtained, showing that either a large excess of carbide must be used, or that carbon must be charged along with the calcium. Curves *E* and *G*, Fig. 5, show the effect of lime on a high-ash coke. Carburization proceeded fairly rapidly at first, but practically stopped until the first slag, which had by now largely increased in silica and alumina from the ash, was replaced by a fresh lime slag.

In studying the effects of the common impurities in cast iron, it has been found that innumerable combinations and concentrations from them are possible. In these experiments the effect of silicon in the absence of other added impurities was first studied. Then the effects of sulphur, phosphorus, and manganese in the presence of about 2.0 per cent silicon were investigated. Enough of the impurity was introduced to indicate its effect, but not enough to get far away from concentrations that might be met in practice, although in a few instances an unusually large amount was used in order to intensify the effect.

Decreases Combined Carbon

Silicon—Although there is reason to suspect that silicon decreases the content of combined carbon in iron, in these tests it was repeatedly found to have practically no effect. The rates of carburization were about the same for steel containing 0.2, 2.0 and 7 per cent silicon. Curves *B* and *C* in Fig. 6 show the rates of carborization of steel containing 2.0 and 0.2 per cent silicon respectively. The curve for 7 per cent silicon is not shown here, but its slope is much the same as the slopes of curves *B* and *C*. Thus it is seen that in these tests the content of silicon had no effect upon the rate of absorption of carbon by molten iron.

The curve in Fig. 7 shows the relation between the carbon and silicon contained in the metal obtained in the three runs made for the purpose of comparing the effect of silicon. The joints on the curve represent the analyses of samples that were taken a few minutes before the charge was tapped. The samples were chilled so quickly that no graphite was ejected during cooling. These values, therefore, represent the carbon contained in the liquid iron and not in the cold pig. The curve was drawn to pass above the point corresponding to 7 per cent silicon, because complete satu-

(*Concluded on Page* 422)

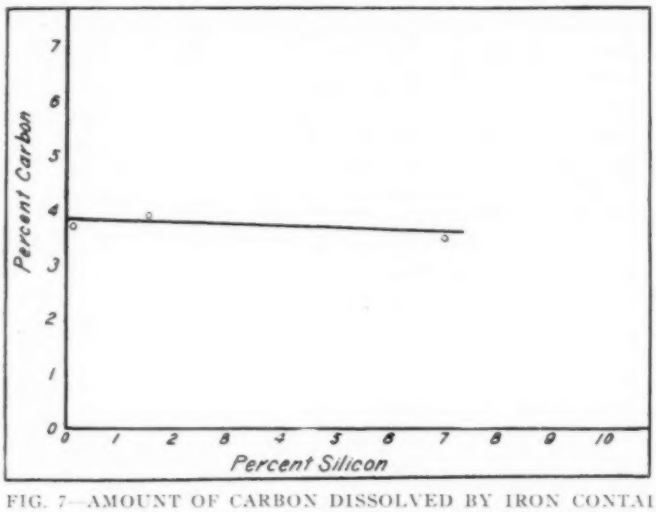


FIG. 7—AMOUNT OF CARBON DISSOLVED BY IRON CONTAINING VARIOUS AMOUNTS OF SILICON OTHER CONDITIONS BEING SIMILAR—POINTS DO NOT INDICATE SATURATION VALUES

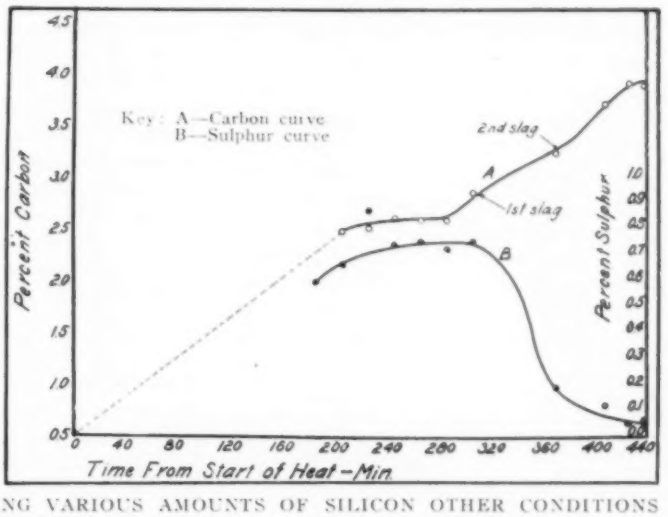


FIG. 8—RELATION BETWEEN CARBON ABSORPTION AND SULPHUR CONTENT

Explain Freak Grain Structure

Various Theories Offered for Cause of Close and Open Grain in the Same Gray Iron Casting Agree That Metal Must Have Been Poured at Different Times

AN ILLUSTRATION of a fractured section of a gray-iron casting showing a close grain on the drag side and an open grain in the cope section was published in THE FOUNDRY April 1, with micrographs of the two sections and analyses of the close-grained and of the open-grained metal. The micrographs showed a marked difference in the structure, as might be expected. The only difference in the composition of the metal was that the phosphorus was slightly lower in the metal with the open grain, and in the metal with the close grain the combined carbon was slightly lower. The principal difference was in the amount of total carbon and graphite in the two sections, both of these being much lower in the open structure which was in the cope. Considerable interest has been aroused by this casting and a number of theories to explain it have been advanced. A few of these are published here.

* * *

Mixing Ladle Was Not Used

By M. DeGlee

SCRUGS MACHINE SHOP & FOUNDRY
GULFPORT, MISS.

In THE FOUNDRY of April 1 you mention a piece of casting with two different structures. A practical foundryman should have no difficulty to explain this phenomenon. As mentioned, the charge in the 42-inch cupola was 1800 pounds. If this was made up of pig iron and scrap and charged in the usual way the pig iron was added first and the scrap placed on top of it. Accordingly the pig melted first. Suppose the cupola tender tapped before the whole charge was down, the first ladle of iron being mostly from the pig iron would have an open-grained structure, while the next ladle of iron would give a casting with a closer structure. Now if the molder with the first ladle poured his mold short the first thing he would do would be to call for the next molder to give him some iron. This man happening to be the molder with iron caught later would fill the mold while the metal from first ladle was solidifying. Iron from this latter ladle would be hot and fluid, and lift the first iron to the top of the mold, because cold iron, or iron in a state of solidification, will float on fluid iron. The analysis shows clearly my view.

	Silicon	Sulphur	Phosphorus	Manganese
Open grain...	2.90	0.055	0.241	1.28
Close grain...	2.89	0.054	0.259	1.27

The moral from this casting is that a mixing ladle should always be used.

Theories and Facts

Three explanations of the cause of close and open grain in the same casting of gray iron have been received and all agree that the casting must have been poured from more than one ladle of iron after iron from the first ladle had partly set. However, the molder who poured the metal is emphatic in saying that such a casting was never poured on his floor except from the same ladle of iron and without interruption of the pouring operation. Mr. De Glee has surmised correctly in concluding that no mixing ladle was used. Possibly other foundrymen have different explanations to offer which would admit of the metal being poured at one time from a single ladle.

* * *

First Metal Chilled after Pouring and Later Was Annealed

By George F. Comstock

TITANIUM ALLOY MFG. CO.,
NIAGARA FALLS, N. Y.

The following is offered as a possible explanation of the structure of the casting described in the article entitled "Close and Open Grain in Same Metal," in THE FOUNDRY of April 1. This structure indicates that the casting has been poured from two ladles of metal which differed in carbon content to the extent noted in the analyses of the two parts of the casting. The bottom part of the casting was, of course, poured first and either because there was not enough metal in that ladle, or because of a run-out from the mold, the mold was not filled at this pouring. This comparatively small amount of metal, possibly cold from being the last metal in the ladle, was chilled by the cold mold and solidified with a fine grain. However, the mold became heated by this first pouring. The casting was finally completed by fresh iron, possibly hotter on account of being the first metal out of another ladle. This hotter metal, entering a warm mold on top of some solid but still hot iron, was not chilled like the bottom layer, but solidified much more slowly, so that it acquired a coarse-grained structure. The bottom layer may not have been cold enough, when the top layer was added, to prevent union of the two layers, yet it was undoubtedly sufficiently solid at that time to prevent their thorough mixing.

The larger percentage of graphite and lower combined carbon in the lower layer may be explained by its being kept at the graphitizing temperature for a longer time by the addition of the extra hot metal above it at this particular period of its cooling. Thus its finer grain was caused by refinement of the primary austenite crystals by rapid solidification in the cold mold, while the increased formation of graphite in it as compared with the upper layer was due to the annealing effect of the hot upper layer upon it, just as graphite is produced in malleable iron by annealing the solid metal.

This seems to me a reasonable explanation of the structure, and it is based on an occurence which might happen once in a great while in almost any foundry.

* * *

Oxides Lower Carbon

By P. A. Peterson

ST. PAUL, MINN.

Close and open grain in the same casting as illustrated and described in THE FOUNDRY of April 1 was evidently due to carelessness on the part of the molder, first, in not skimming his ladle, and second, in not using a skimming gate. That the pound of cure he applied to keep from having an unfilled casting was successful, is shown by the fact that the casting got in service, yet it did not equal the ounce of prevention in producing a homogeneous casting.

The pouring was evidently interrup-

ted by the plugging up of the gate with scum from the ladle when the mold was half full, and opened again either with a rod or by using a fresh ladle of hot metal from the cupola, the latter method frequently being used. The fracture shows that the first metal had chilled somewhat before the second metal entered.

That there must have been considerable oxide on the first metal to give a vigorous reaction with the carbon of the second is shown by the fact that this portion contained a considerably lower percentage of carbon which was uniformly distributed. The coarser grain size of the upper portion is due to its slower rate of cooling caused by the hot, solid lower portion.

Had there been but a thin skin of oxide on the first metal, the reaction would have been but slight and confined to a narrow zone at the joining of the two where partial decarbonization took place with formation of gas and consequent blowholes. This condition is found quite often in pouring ingots, a leaky stopper or splashing in the mold causing portions to adhere in the upper part of the mold, freezing instantly and becoming oxidized. As the mold fills up, the carbon of the hot metal reacts with the oxidized surface of the catch, as it is called. This catch adheres more or less firmly, sometimes stripping off in the bloomer or scabbing in the smaller mills, but the defect generally shows plainly in the finished bar.

In the foundry there are no subsequent processes which bring out a defect so clearly, and if there were, this condition of open and closed grain in the metal would be shown to be more common than is supposed. Visual examination is about the only means we have at present of judging a casting without breaking it. To reconcile the theory, as here outlined, with the surface appearance, which must have been normal to pass inspection, is the most difficult feature. To get rid of the gas formed, to keep the face of the cope intact under the violent boiling action, would require a strong, open, dry-sand cope, well vented and weighted and can only be accounted for by the intense baking action of the first metal and the fact of a simple cross section.

If the theory is correct, the following could be expected:

1—The first metal should show somewhat the profile of an open-sand casting with maximum thickness at the edge.

2—A zone at the line of demarkation slightly more decarbonized than the rest of the upper position.

3—Coarse polygonal crystals in this zone with perhaps oxide in thin envelopes, or at the intersections.

4—On the upper edge of this zone the maximum concentration of blowholes.

It might be remarked here that it is the near wasters rather than the wasters that cause the most loss to the foundry business.

Nonferrous Committee Discusses Alloys

A conference of the advisory committee on nonferrous alloys of the institute of metals division of the American Mining and Metallurgical Engineers with representatives of the United States bureau of mines was held at the bureau of mines, Washington, April 25. This was the second meeting held for the purpose of developing a program of co-operation between the nonferrous metal industries, as represented by the institute of metals advisory committee, and the bureau of mines, with especial reference to the nonferrous work of the latter organization.

The conference discussed the question of the functions and possibility of development of the proposed Alloys Research association, now known as the Alloys Research Information Service. As originally proposed, it was the idea to receive contributions of $250 each from firms in the nonferrous metal industry for promoting a central information service. A fund of $40,000 was required for this work, which would begin as an information and abstracting service and later develop into a central research laboratory. The feeling was that, owing to the depressed industrial situation, it would not be a propitious time to push the matter. Members representing industrial concerns stated that their companies would be willing to enter such an association when conditions are better.

The work of the Ithaca, New York, station of the bureau of mines on the effect of inclusions on the endurance of alloy steels was outlined by Dr. H. W. Gillett, who mentioned the rise-of-temperature test as a method for facilitating fatigue tests and showed the importance of the problem in both ferrous and nonferrous metals.

The question of refractories for the Ajax-Wyatt furnace was brought up by William B. Price of the Scovill Mfg. Co. The facilities of the ceramic section of the bureau of mines were offered as a clearning house for information in regard to refractories for the furnace.

R. J. Anderson, metallurgist of the bureau of mines, outlined the results of recent work at the Pittsburgh experiment station in regard to the contraction of aluminum alloys, removal of stress in brass tubing, and heat treatment of cast nonferrorus alloys. He stated that linear contraction experiments had been run in chill molds and sand molds on 40 aluminum alloys, and the results showed that in the series of alloys the contraction varied between the limits 0.95 and 1.70 per cent. It was stated that shrinkage is dependent upon structural changes occurring on solidification and that there is not necessarily any relation among shrinkage, hot shortness, and tensile strength. It also was said that the effect of degasifying and deoxidizing alloys might have some considerable effect on shrinkage and hot shortness.

The question of so-called super-refractories was discussed, and the statement made that certain of these, such as synthetic spinels, had been worked out successfully on the Pacific coast.

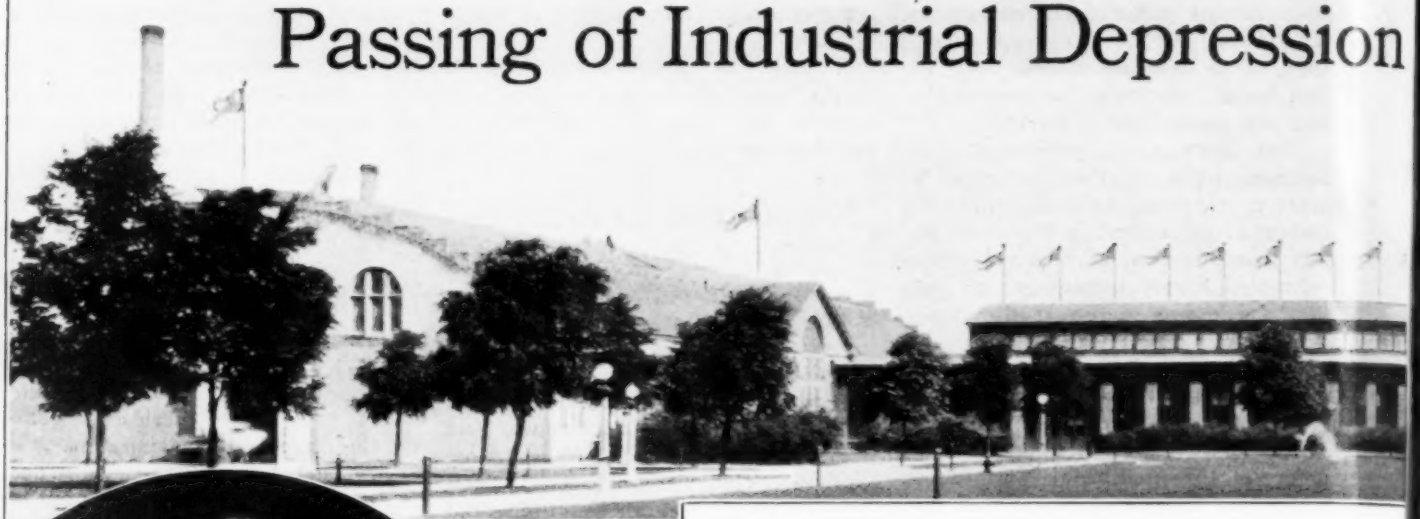
Those attending the meeting were: Wm. B. Price, Scovill Mfg. Co., L. W. Olser, Ohio Brass Co., Wm. A. Covan, National Lead Co., Lawrence Addicks, consulting engineer., Geo. C. Stone, New Jersey Zinc Co., W. R. Webster, Bridgeport Brass Co., P. E. Merica, International Nickel Co., H. C. Jennison, American Brass Co., H. W. Gillett, U. S. bureau of mines, R. J. Anderson, U. S. bureau of mines, Comdr. H. H. Bowson, bureau of ordnance, navy department, O. C. Ralston, U. S. bureau of mines, C. E. Williams, U. S. bureau of mines, D. A. Lyon, U. S. bureau of mines, R. B. Moore, U. S. bureau of mines, W. M. Corse, Monel Metal Products Corp., J. E. Crown, Washington navy yard, Jerome Strauss, U. S. navy yard, P. E. McKinney, U. S. naval gun factory, J. E. Jones, Westinghouse Electric and Mfg. Co.

Will Use Powdered Fuel

Pulverized coal in conjunction with blast furnace gas will be utilized as fuel by the Tennessee Coal, Iron & Railroad Co., in a new boiler installation at Ensley, Ala. The Fuller Engineering Co., Allentown, Pa., will install the complete coal drying, pulverizing and conveying system for this plant; also the burners and feeders for five 834-horsepower boilers designed to operate at 200 per cent of rating.

William E. Dougherty has been appointed to the sales force of the Philadelphia office of the Independent Pneumatic Tool Co., 600 W. Jackson Blvd., Chicago.

Passing of Industrial Depression



W. R. BEAN, Pres., A. F. A. 1920-1922

Two-Year Interval Since the Columbus Conve tion and Exhibition of the Amer.can

FOUNDRYMEN long will remember the week of June 5 to 9, 1922. These dates will fix a tangible period by which to recall the passing of the post-war depression. The turning point was noted in the early spring, but in after years, prosperity's return will be coupled in the minds of castings producers with Foundrymen's Week, marked by the convention and exhibition of the American Foundrymen's association at Rochester, N. Y. After two years of greatly limited activity, during which the foundry industry has passed through a most severe business crisis, the Association again steps forward and calls together the foundrymen of the country for another of its memorable conventions. The exhibition, the technical sessions, and the interchange of ideas upon the floor of the convention, or between individuals, all will serve to point the way toward industrial reconstruction.

No foundry owner, shop superintendent or foreman, face to face with the pressing problems of present competitive conditions can afford to miss this opportunity. When times were hard, foundries were operating on low schedules or were closed entirely and when no castings business could be had a convention of this character would have offered little of interest or inspiration. Now, it is most important, and coming as it does on the threshold of a period of opportunity and prosperity, it cannot fail to be of service.

Despite the period of depression, progress in castings manufacture has not halted. New ideas have developed under stress of necessity, new equipment has been devised to bring lower costs in production, and scientific advance in the mixing and melting of metals has been stimulated by the times. The Rochester convention, with its splendid program of papers, its assemblage of the highest type equipment to be exhibited and demonstrated, and finally by gathering together of the greatest minds in the industry, should and undoubtedly will be a record breaker for attendance and interest.

Following the precedent established soon after the war the international character of the industry will be to give full attention in the various technical sessions. It will be remembered that last year a policy of exchange of papers was inaugurated between the American Foundrymen's association and the Institution of British Foundrymen. Last year a paper by George K. Elliott, Lunkenheimer Co., Cincinnati was presented at a meeting of the latter society. This year the first British paper to be presented before the American association will be read

Condensed Program

Monday, June 5

10:00 a. m.—Registration, building No. 3, Exposition park.

10:00 a. m.—Opening of exhibit, Exposition park. Exhibits remain open until 5 p. m.

2:00 p. m.—Opening joint session, American Foundrymen's association and Institute of Metals division of the American Institute of Mining and Metallurgical Engineers.

Tuesday, June 6

9:00 a. m.—Exhibits open.

9:30 a. m.—International technical session, auditorium, Exposition park.

9:30 a. m.—A. I. M. E. Metallography Session.

2:00 p. m.—Nonferrous session A. F. A.

2:00 p. m.—Steel session.

7:00 p. m.—Exhibits open and remain open until 10:00 p. m.

Wednesday, June 7

9:00 a. m.—Exhibits open until 5:00 p. m.

9:30 a. m.—Steel session, auditorium.

9:30 a. m.—Nonferrous session held jointly by the A. F. A. and the institute.

2:00 p. m.—A. I. M. E. brass foundry session.

2:00 p. m.—Industrial relations session, auditorium.

7:00 p. m.—Annual banquet, Powers hotel, Rochester.

Thursday, June 8

9:00 a. m.—Exhibits open until 5:00 p. m.

9:30 a. m.—Molding sand research session, auditorium, Exposition park.

1:00 p. m.—Entertainment feature: Boat ride.

Friday, June 9

9:00 a. m.—Exhibits open until 5:00 p. m.

9:30 a. m.—Malleable session, followed by business session, auditorium.

Marked by Rochester Convention

October, 1920 To Be Ended by Technical Sessions
Foundrymen's Association in June

C. R. MESSINGER,
V. P., 1920-1922

by F. J. Cook, Rudge-Littley, Ltd., West Bromwich, near Birmingham, England. The opening joint session will be devoted largely to papers prepared by foundrymen of high standing in Europe.

Two steel foundry sessions have been arranged where full attention will be given to open-hearth, converter and electric processes in the light of the last few years development. Sand, that most vital element in seccessful steel casting, will be considered and some marked advances will be reported, based upon experimental and practical investigations.

The brass and aluminum foundryman will find the nonferrous sessions schedule this year to be the most interesting and valuable ever attempted. The American Foundrymen's association will have two joint sessions with the members of the Institute of Metals division of the American Institute of Mining & Metallurgical Engineers, at which the problems of molding, melting and casting brass will be dicussed. In addition to these joint meetings, the latter society will hold two sessions, one devoted to the metallographical features of nonferrous metals.

Other meetings which always are productive of much information are those devoted to general foundry subjects, to gray iron, to industrial relations and to malleable iron. The latter, in particular, will assume an international aspect from the discussion of European malleable practice. An entirely new departure, and one which promises to be most valuable, is the sand research session, at which the selection, preparation and testing of molding sands will be considered. The past two years have been productive of much progress in this direction and a record of this advancement will be put before the industry at the Rochester meeting.

The season is fortunately chosen for this meeting. Northern New York and particularly the Genesee valley in which Rochester is located, is noted for its beauty of scenery and for the charm of its picturesque communities. Excellent roads leading into the city from New England, New York, Pennsylvania, Ohio and the Central States afford pleasant cross country drives and special facilities are to be provided by the Rochester committees for the comfort and convenience of those who travel to the convention by automobile.

To many who visit Rochester for the first time, the city has many surprises to offer. Any mention of this active industrial center among an average group will bring forth some remark upon the *Rochester idea* or the *Rochester spirit*, which carries with it

Tentative Program of Nonferrous Sessions

IN ADDITION to the joint meetings scheduled with the American Foundrymen's association and the brass foundry session of that organization, the following meetings devoted to nonferrous subjects will be held under direction of the Institute of Metals division of the American Institute of Mining and Metallurgical Engineers.

Metallography Session

Tuesday, June 6

9:30 a. m.—Physical Properties of Cartridge Brass, by C. Upthegrove and W. G. Harbert.

Effects of Impurities on Electrolytic Zinc, by G. D. Scholl.

Mechanism of Metallic Oxidation at High Temperatures, by N. B. Pilling and R. E. Bedworth.

Extreme Sensitiveness of the Action of Reducing Atmosphere Upon Heated Copper, by T. S. Fuller.

Some Electrical Properties of Nickel and Monel Wires, by F. M. Sebast, M. A. Hunter and A. Jones.

Brass Foundry Session

Wednesday, June 7

2 p. m.—Temperature Problems in Foundry and Melting Room, by John P. Goheen.

Core-Oven Tests, by F. L. Wolf and A. A. Grubb.

Occurrence of Blue Constituent in High Strength Manganese Bronze, by E. H. Dix jr.

Gas Absorption and Oxidation of Nonferrous Metals, by Bruno Woyski and John W. Boeck.

Some Interesting Unsolved Problems of the Foundry, by W. M. Corse.

Foundry Difficulties, by Adolph Bregman.

Schuyler H. Earl

Norman Van Voorhis

Matthew Elliott

George B. Pettingill

T. A. Soults

A. H. Jones

Louis P. Willsea

H. G. Hetzler

ROCHESTER'S LEADING FOUNDRY OWNERS AND EXECUTIVES ARE PROMINENTLY ACTIVE IN THE PRELIMINARY WORK OF CARING FOR THE CITY'S JUNE GUESTS

Tentative Program of A. F. A. Sessions

Monday, June 5

10:00 a. m.—Opening of exhibits
Registration

2:00 p. m.—Joint opening session, American Foundrymen's association and the Institute of Metals division of the American Institute of Mining and Metallurgical Engineers

Tuesday, June 6

International Session

9:30 a. m.—Annealing of Gray Iron, by J. F. Harper and R. S. McPherron, Allis-Chalmers Co., Milwaukee.

European vs. American Molding Machine Practice, by E. Ronceray, president, Societe Anonyme des Establissements Ph. Bonvillian and E. Ronceray, Paris.

Making Typewriter Frames in a Belgian Foundry, by Joseph Leonard, president, Association Technique de Fonderie de Liege; Herstal, Belgium.

Destruction and Reconstruction of French Foundries, a memoir submitted by the Association Technique de Fonderie de France.

Cupola Melting Tests with Mixtures Changing During Run, by Richard Moldenke, Watchung, N. J.

American vs. British Cast Iron, by F. J. Cook, Rudge-Littley, Ltd., annual exchange paper of the Institution of British Foundrymen

Steel Session

2:00 p. m.—Side Blow Converters for Steel Foundries, by T. Levoz, Association Technique de Fonderie de France

Tests with Cerium as a Deoxidizer and Desulphurizer in Red Brass, Cast Iron and Converter Steel, by L. W. Spring, Crane Co., Chicago.

A Study of the Change of Grain Size of Silica Sand Through the Constant Addition of Clay, by R. J. Doty, Sivyer Steel Casting Co., Milwaukee.

Accurate Control of Analyses in Acid Electric Steel Furnaces, by A. C. Jones, Electric Steel Co., Chicago

A Managerial Study of Oxy-Acetylene Cutting and Welding in Foundries, by G. O. Carter, consulting engineer, the Linde Air Products Co., New York.

A. F. A. Brass Foundry Session

2 p. m.—Technical Control of McCook Field Foundry, by E. H. Dix Jr., McCook Field, Dayton, O.

Selection of Fuels and Furnaces for Melting Copper and Brass Alloys, by T. H. A. Eastick*

Porosity of Nonferrous Metals, by R. R. Clarke, Pittsburgh

An Investigation of Segregation With a View to Preventing Its Occurrence in Castings Made of High-Lead Bronze, by R. E. Lee and F. B. Trace, Allegheny college, Meadville, Pa.

Brass Forgings, by C. G. Heiby, Mueller Metals Co., Port Huron, Mich.

Two-Part Castings Made in Three-Part Molds, by W. H. Parry, Brooklyn, New York

History of Monel Metal and Nickel, by W. M. Corse, Secretary, Institute of Metals Division, A. I. M. M. E.

*Deceased.

Wednesday, June 7

Steel Session

9:30 a. m.—A New Electric Furnace, by R. Sylvany, Association Technique de Fonderie de France

Impact Tests on Steel, by F. C. Langenburg, Watertown Arsenal, Watertown, Mass.

Progress in Open-hearth Process, by Willis McKee, of Arthur G. McKee & Co., Cleveland

Report of committee on specification for steel castings.

Joint A. F. A. and A. I. M. M. E. Aluminum Session

9:30 a. m.—Cracks in Aluminum-Alloy Castings, by R. J. Anderson, bureau of mines, Pittsburgh.

The Effect of Impurities on the Oxidation and Swelling of Zinc-Aluminum Alloys, by M. M. Pierce and Mr. Brauer.

Use of Secondary Aluminum Ingot in Foundry Practice, by W. M. Weil, National Smelting Co., Cleveland

Aluminum and Aluminum Alloy Melting Furnaces, by R. J. Anderson, bureau of mines, Pittsburgh

Melting Aluminum for Rolling Into Sheets, by J. A. Lange, Western Springs, Ill.

General and Gray Iron Session

9:30 a. m.—A Study of the Weight of Iron Castings, by J. D. Wise, University of Illinois, Urbana, Ill.

Electrically Heated Metal Patterns, by C. A. Cremer, Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

Flask Equipment for Molding Machines, by Arnold Lenz, Saginaw Products Co., Saginaw, Mich.

Design of Geared Ladles, by A. W. Gregg, Whiting Corp., Harvey, Ill.

Investigations Relative to Insulated Core Oven Design and Performance, by C. F. Mayer, Ohio Body & Blower Co., Cleveland

Electric Cranes in Foundry Service, by A. H. McDougall, Whiting Corp., Harvey, Ill.

Technical School Foundries, by J. D. Hoffman and R. E. Wendt, Purdue University, Lafayette, Ind.

Report of A. F. A. subcommittee on specifications for cast-iron wheels

Memorial on Corrosion of Cast Iron, by H. Y. Carson, American Cast Iron Pipe Co., Birmingham, Ala.

Report of committee on specifications for gray iron castings.

Industrial Relations Session

2:00 p. m.—Report of A. F. A. committee on safety, sanitation and fire protection.

Cycles of Depression and Their Prevention, by Ernest F. Du Brul, general manager, National Tool Builders' association, Cincinnati

Prevention of Waste in Industry, by L. W. Wallace, executive secretary, The Federated American Engineering societies, Washington.

Time Study and Job Analysis in the Foundry, by A. J. Kramer, Deering Works, International Harvester Co., Chicago

Eye Protection and Safe Clothing in the Foundry, by Buell W. Nutt, The Safety Equipment Service Co., Cleveland.

Thursday, June 8

Molding Sand Research Session

9:30 a. m.—The Preparation of Steel Foundry Sands, by S. H. Cleland, National Engineering Co., Chicago

Establishing a Method of Testing for Green Bonded Strength, by R. J. Doty, Sivyer Steel Casting Co., Milwaukee

Significance of Screen Test of Molding Sand, by H. A. Schwartz, National Malleable Casting Co., Cleveland

Reports of joint committee of American Foundrymen's association and National Research council committee on molding sand research

Friday, June 9

Malleable Cast Iron Session and General Business Session

9:30 a. m.—The Manufacture and Properties of Refractories for Air Furnaces, by C. E. Bales, Louisville Fire Brick Co., Highland Park, Ky.

The Behavior of Fire Brick in Malleable Furnace Bungs, by H. G. Schurecht, bureau of mines, Columbus, Ohio

A European View of the Malleable Problem, by T. Levoz, Association Technique de Fonderie de France

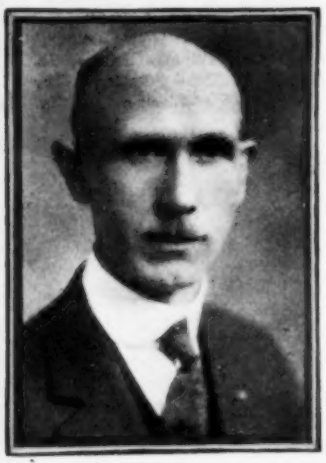
Use of Carbon Dioxide Recorders in Controlling Combustion of Powdered Coal, by D. M. Scott, The T. H. Symington Co., Rochester, N. Y.

Use of Pulverized Coal for Malleable Foundries, by E. E. Griest, Chicago Railway Equipment Co., Chicago

When and Where the Foundry Should Use Electric Heat, by E. F. Collins, General Electric Co., Schenectady, N. Y.

Report of committee on Malleable Castings specifications.

The Relation of Temperature to the Form and Character of Graphite Particles in the Graphitization of White Cast Iron, by E. J. C. Fisher, Atlas Die Casting Co., Worcester, Mass.



David Baxter

A.N. Brayer

W.W. Sanderson

E.A. Scheibe

William J. Ward

V.L. Whitehead

Donald S. Barrows

Edgar F. Edwards

George Ely

HOTEL ACCOMMODATIONS AND THE VARIOUS FEATURES OF ENTERTAINMENT TO BE PROVIDED HAVE BEEN PLANNED IN DETAIL BY LOCAL COMMITTEES

Rochester Convention Committees

Executive Committee

Norman Van Voorhis, chairman ..... Galusha Stove Works.
P. B. Van Deusen, Secretary ..... Rochester Chamber of Commerce.
Schuyler H. Earl..... Gleason Works.
Matthew Elliott..... Erie Foundry Co.
H. G. Hetzler..... North West Foundries, Inc.
A. H. Jones..... American Wood Working Machine Co.
George B. Pettingill.... T. H. Symington Co.
T. A. Soults..... Sill Stove Works.
Louis P. Willsea..... Willsea Works.

Entertainment Committee

H. G. Hetzler, chairman ..... Northwest Foundries, Inc.
David Baxter..... Monroe Ave., Brighton Station.
A. N. Brayer..... Co-operative Foundry Co.
C. E. Hoyt..... Secretary American Foundrymen's Assn.
W. B. Robinson..... Iron Age, Pittsburgh, Pa.
W. W. Sanderson..... Carborundum Co., Niagara Falls, N. Y.
E. A. Scheibe..... Bausch & Lomb Optical Co.
William J. Wark..... E. J. Woodison & Co., Buffalo, N. Y.
Delos H. Gray..... National Brass Mfg. Co.
V. L. Whitehead..... Whitehead Bros., Buffalo.

Banquet Committee

W. R. Bean, president.. American Foundrymen's Assn.
Alfred R. Howell, J. P. Pero, past presidents..... American Foundrymen's Assn.
G. B. Pettingill..... T. H. Symington Co.
Louis P. Willsea..... Willsea Works.

Golf Committee

Matthew Elliott, chairman ..... Erie Foundry Co.
Donald S. Barrows.... T. H. Symington Co.
William S. Riley..... W. S. Riley Co.
J. F. Weller..... Kellogg Mfg. Co.

Hotel Committee

A. H. Jones, chairman. American Woodworking Mach. Co.
A. R. McHenry..... T. H. Symington Co.
A. J. Messner..... Powers Hotel.

Publicity Committee

Edgar F. Edwards, chairman ..... Rochester Industrial Exposition Assn.
George Ely ..... American Woodworking Machine Co.
H. G. Stellwagen..... North West Foundries, Inc.

Reception and Information Committee

Louis P. Willsea, chairman ..... Willsea Works.
Arthur Batzold ..... National Car Wheel Co.
Matthew Elliott ..... Erie Foundry Co.
J. W. Fulreader..... James Cunningham, Son & Co.
James E. Gleason..... Gleason Works.
G. W. Griswold..... S. B. Roby Co.
Fratz Haverstick..... Haverstick & Co.
David R. Henry..... Flower City Foundry Co.
Charles P. Hery..... Ingersoll, Erskine & Hesly.
A. C. Kehr..... Foster-Armstrong Co.
V. C. Kreuter..... American Laundry Machine Co.
Paul J. Lemke..... Bausch & Lomb Optical Co.
James McHenry..... Gleason Works.
S. E. Miller ..... Sargent & Greenleaf, Inc.
S. W. Miller..... Rochester Welding Works.
Charles S. Owen..... Chapin-Owen Co.
Theodore Pickering..... Josiah Anstice & Co.
Robert L. Poole..... General Railway Signal Co.
T. A. Soults..... Sill Stove Works.
Mayor Clarence D. Van Zandt ..... City Hall.

Finance Committee

Schuyler H. Earl, chairman ..... Gleason Works.
Matthew Elliott..... Erie Foundry Co.
Norman Van Voorhis... Galusha Stove Works.

some pleasurable meaning to the mind of all present. One has but to visit and become acquainted with the community and its people to find the germ from which this reaction is cultured.

Rochester fundamentally is a city of homes. Its industries are those which demand the highest type of intelligent workmen, and its executives all seem imbued with the feeling which made the old time close knit organization with its close personal association the model which modern welfare activities seek to follow. This human interest, the close contact of manager and man and the mutual respect for the high calling of each, has set up this elusive but strongly evident *Rochester spirit*. It is aided and fostered by an active and efficient chamber of commerce, and is advertised to the world by the character of the products made within Rochester, but it could not exist without the assistance of the high standard of industrial ideals.

The Bausch & Lomb Optical Co. is typical of the industries of Rochester. Employing approximately 4000 people, with almost 25 acres of floor space, close contact is maintained between the officers and employes, and the sincere understanding which exists is remarkable in so extensive an institution. Unique in its product and its management, this concern boasts a veterans club of 200 members who have been employed with the company for over 25 years. John J. Bausch, America's pioneer manufacturer of optical goods is 91 years old; yet each day he takes his place in a small shop on the upper floor, and exercises a kindly paternal influence in the affairs of the whole institution.

In one of the corners of this great establishment stands a foundry which is perhaps unmatched throughout the world. Its output includes iron castings for the machines, containers and precision instruments used in making the lens, microscopes, telescopes, eyeglasses, binoculars, range finders, periscopes and others of the 700 diffent products manufactured by the company. Further, a most complete brass foundry is in constant service supplying the many metal parts which enter into these same products. As Paul J. Lemke, the superintendent of this interesting foundry states, "No jobbing shop could stay in business and meet the rigid requirements of our customers." He might have added that few could attain to the quality of workmanship required in the castings which are used.

The firm of Bausch & Lomb was established in 1853 to meet the need for better lens than could be imported from Europe. As the busniess developed optical glass was imported in increasing quantities from Europe. Early experiments in making this necessary raw materials were futile; but with the start of the war and intensified effort, a thoroughly satisfactory product was evolved and today, the achievement, largely due to this company has broken a European monopoly of long standing.

Rochester has been termed the *City of Varied Industries*. This appellation is so often used in describing the various cities of this country, where local demand and the isolation, which existed before the country was tied together by rapid transportation, brought many lines of industry, that a brief statement supporting Rochester's use of the title may be of interest.

Everyone who has heard of Rochester thinks *kodak* by reflex, and, such is the merit of advertising, the name of the company which is coupled with this term follows closely. Under the prestige of this company's output,

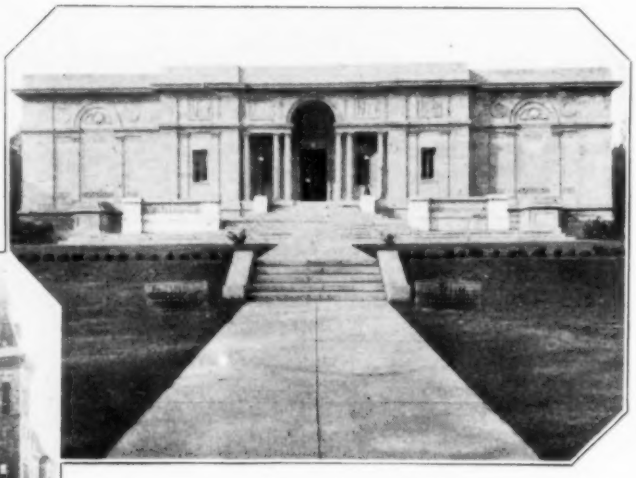
Welcome Awaits

A Few of Rochester's Many

Broad streets make the business district pleasing

Three waterfalls on the Genesee attest the power resources of the city and add a measure of scenic beauty and attractiveness

Many residences are of unusual attractiveness



Rochester's public buildings possess a simple dignity and effective style—At the left is the court house and above is shown the Memorial art gallery on the University of Rochester campus

A. F. A. Visitors

and Varied Points of Interest

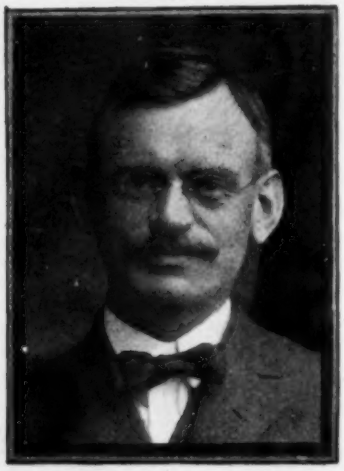
Practically all electric lines reach Main street

High architectural standard is evidenced even in the manufacturing buildings

Many interesting parks are within easy access by street car

Five steam and five electric lines reach the city—One of the railway stations is shown above—At the right is one of the armories of which two are maintained in Rochester by the state

H.G. Stellwagen



J.W. Fulreader

G.W. Griswold

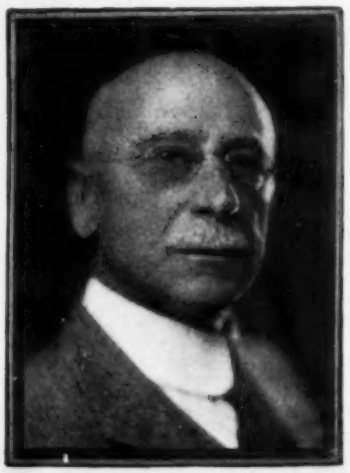
Charles P. Hery

Charles S. Owen

Paul F. Lemke

V.C. Kreuter

Theodore Pickering



Clarence D. Van Zandt

LONG EXPERIENCE IN HANDLING LARGE CONVENTIONS AND PUBLIC MEETINGS HAS DEVELOPED IN THE CITY A PECULIAR APTITUDE FOR SUCH AFFAIRS

Payment will be made for all contributions on foundry and pattern shop practice suitable for publication

Note—This sheet may be cut into two sections, 5 x 7 inches, and may be readily bound in note book form

ROUTINE ANALYTICAL METHODS

By J. W. Bolton and W. T. Sheffield

DETERMINATION OF CHROMIUM AND VANADIUM IN CAST IRONS

Chromium

Principle—Chromium is determined most conveniently by the reduction of chromic acid to a chromic salt by ferrous ammonium sulphate, or ferrous sulphate, and determination of the excess of the latter reagent by an equivalent solution of potassium permanganate, according to the following equations:

(1) $6\ FeSO_4+2\ CrO_3+6\ H_2SO_4=3\ Fe_2(SO_4)_3+Cr_2(SO_4)_3+6\ H_2O$

(2) $10\ FeSO_4+2\ KMnO_4+8\ H_2SO_4=5\ Fe_2(SO_4)_3+K_2SO_4+2\ MnSO_4+8\ H_2O$

Solutions

Nitro-Sulphuric Acid—400 cc. conc. nitric acid plus 1400 cc. water plus 200 c. c. conc. sulphuric acid.

Ferrous Ammonium Sulphate—19.5815 grams of the c. p. crystals per liter of water. Dissolve in 200 c. c. H_2O plus 50 c. c. conc. H_2SO_4.

Potassium Permanganate—1.58 grams of the c. p. salt dissolved in 500 to 600 c.c. H_2O, made up to 1000 c. c., allowed to stand about 10 days and filtered through asbestos.

Potassium Ferricyanide—5 grams to 130 c.c. H_2O.

Procedure—Dissolve 1 to 5 grams of iron—according to chromium content—in 150 c. c. nitro-sulphuric acid. Add 5 c.c. conc. nitric acid and dilute to 250 c. c. with hot water. Boil and add from a pipette a saturated solution of potassium permanganate in slight excess and boil until pink of excess $KMnO_4$ disappears, with formation of chocolate colored precipitate. Coal and filter through an alundum thimble or asbestos, by suction. Wash filter thoroughly with 10 per cent H_2SO_4. Transfer filtrate to 500 c. c. beaker and add 30 c. c. 1-3 H_2SO_4. The volume now should be 350 to 400 c. c. Add from a burette sufficient volume of standardized ferrous ammonium sulphate solution to entirely discharge the orange color due to the chromic acid, and about 3 c. c. excess. Stir well and allow to stand one minute. Titrate excess of ferrous ammonium sulphate with

(*Continued on Data Sheet No.* 430)

ROUTINE ANALYTICAL METHODS

(*Continued from Data Sheet No.* 429)

an equivalent solution of $KMnO_4$ to the first pink tinge that is permanent for one minute. Note burette readings. Add 4 c. c. more of ferrous ammonium sulphate, stir and repeat titration. Net amount of ferrous ammonium sulphate consumed in the duplicate titrations should check to 0.1 c. c.

Calculations—Net c. c. ferrous ammonium sulphate times chromium equivalent of that solution divided by number of grams in sample equals per cent of chromium in the sample.

Vanadium

Principle—If vanadium is present, the treatment outlined for chromium to the point of titration will oxidize it to the pentavalent stage (V_2O_5). Vanadic acid as well as chromic acid is reduced by ferrous ammonium sulphate according to the equation

$3\ V_2O_5+6\ FeSO_4+9\ H_2SO_4=3\ (VO_2)_2(SO_4)_3+3\ Fe_2(SO_4)_3+9\ H_2O$

However, in titration with standard $KMnO_4$, divanadyl sulphate is oxidized to divanadyl trisulphate, according to the equation

$5\ (VO_2)_2(SO_4)_3+2\ KMnO_4+8\ H_2SO_4=5\ (VO_2)_2(SO_4)_3+K_2SO_4+2\ MnSO_4+8\ H_2O$

If the solution be now titrated with ferrous ammonium sulphate, divanadyl sulphate is again formed, excess of the ferrous iron being indicated by formation of intense blue of iron ferricyanide with potassium ferricyanide which has been added as an internal indicator.

Procedure—Immediately after finishing the chromium titration, add 0.6 c. c. potassium ferricyanide solution, stir and *immediately* add standard ferrous ammonium sulphate until the color of the solution has turned from a greenish tan to a yellow, then to a pure green, a blue green, and finally to a distinct blue. This is taken as the end point.

Calculation—Number of c. c. ferrous ammonium sulphate required to bring end point minus number of c. c. same reagent required by blank times vanadium value, or equivalent of solution divided by number of grams in sample, gives the percentage of vanadium in the sample.

(*Continued on Data Sheet No.* 431)

Rochester leads the world in the production of cameras, films, and other photographic supplies. The firm previously mentioned at some length establishes the city's claim to first place in the manufacture of optical goods. Thermometers, check protectors, filing devices and office systems, soda fountain supplies, and mail chutes, in which first place on the production chart is claimed, constitute another count toward the title of the City of Varied Industries. Other materials and finished articles which appear in the list of manufactures read like the index of a mail order catalog. A hasty enumeration will suffice: Automobiles, equipment and parts for automobiles and trucks, machinery, electrical supplies and equipment, trunks, stoves, stamped metal ware, perfumes, furniture, tools, dental chairs, jewelry, castings, candy, paper boxes, beds, carbon paper, type-writer ribbon, ivory buttons, shoes, mens clothing, railway equipment, laundry machinery railway signalling devices, tools and many other smaller industries which go to make up a total of 350 commodities from 1650 different factories. One of the most important branches of those manufactures enumerated, considered in the light of foundry operations is the building of railway equipment and signaling devices. The General Railway Signal Co. operates an extensive gray-iron, brass and aluminum foundry. Closely adjoining is the plant of the T. H. Symington Co., which embraces about six acres under one roof.

The output of the latter institution consists of malleable-iron journal boxes and draft-gear attachments for both passenger and freight cars, and malleable castings for other railway equipment. The foundry is one of the largest exclusive malleable shops in the country, with its melting capacity of 45,000 tons of finished castings per year. The furnaces, each capable of handling two 26-ton charges per day are fired with pulverized coal supplied from a central station. The castings are annealed in 21 annealing ovens, each with a capacity of 80 tons. The average production of journal-box and draft-gear castings is sufficient to equip 36,000 cars annually. Donald S. Barrows, vice president in charge of operations, and George B. Pettingill, general purchasing agent of this firm are active in the preparations which Rochester is making for the entertainment of visiting foundrymen in June.

Machinery manufacture also plays an important part in maintaining the city's stand in the foundry world. The American Laundry Machinery Co., American Woodworking Machinery Co. and the Gleason Works stand out strongly in this regard. The latter is a large producer of machine tools and possesses an exceptionally well designed plant.

The industrial standing of the city may be traced directly to its natural power facilities, and its location with reference to water transportation. The Genesee river with its series of three falls within the city limits gives a combined drop of 267 feet and develops over 50,000 horsepower which is utilized to the fullest extent in driving industrial machinery. Further, the same river provides a natural port with ready access to Lake Ontario. In fact, the river has made Rochester, as a passing glance at the history of the community will show.

Even before the advent of the white man, the Seneca nation of the Iroquois tribe, migrating across from west of the Mississippi found the Genesee valley attractive. This nation, which with the Onondaga and Mohawk tribes comprised some 1400 to 1500 people, dominated northern New York, subdued some of the less fierce tribes and played a most important part in determining the right of future possession between the rival claimants, England and France.

The vicinity of Rochester is full of historic associations which hark back to the days of the Senecas, and the trails of that tribe provided the pathways by which the whites came to the banks of the Genesee. An adopted son of the Senecas, Indian Allan, was the first white settler of whom record exists, and his possession of a tract of land now embracing Rochester was prompted by the availability of water power for a grist mill.

In 1800 three pioneers pushed out from Maryland with their families to establish their homes in what was then the western frontier. These men were Col. William Fitzhugh, Maj. Charles Carroll and Col. Nathaniel Rochester. The latter, in 1802 purchased a tract of 100 acres from Indian Allan, paying $17.50 an acre. The standing of this man, whose name was given to the city which will welcome the foundrymen next month, may be appreciated from the fact that he was a member of the constitutional convention from North Carolina, and further that he had been deputy commissioner general of military stores for that state, with a commission to manufacture arms. Thus this man, who in his time might be classed as an industrial leader, set up a community based upon the natural facilities of the locality. With his wife, five sons, five daughters and 10 slaves, he built a settlement, established a saw mill, a grist mill and later set up at Dansville, near Rochester, the first paper mill west of New Jersey.

The community must have grown with marked rapidity, for when the British and their Indian allies threatened a landing at the Port of Genesee in 1812, 33 Rochester patriots journeyed across country and with other settlers discouraged the attempt. The force, though small, was augmented in the sight of the British commander by marching the men over the brow of a hill and back again out of sight at the foot, with such success that the attacking ships drew off without attempting fight.

Commercially, the city was on a firm footing at this time, but incorporation, under the name of Rochesterville did not occur until 1817. This name soon was succeeded by the present appellation and a steady growth ensued until Nov. 4, 1824 marked another important step in industrial development which may be traced directly to the city's location. On that date, the Erie canal was completed and a new gateway for the distribution of manufactured products became available. Today, this waterway has given way to the newly completed New York state barge canal, which runs into the city, with a harbor three miles long, and two piers each nearly a mile long. The old Erie canal at present is being converted into a subway for suburban electric trains with a boulevard reaching directly through the heart of the business section and across the residential districts from the southeast to the northwest.

As the city grew and developed, the varied industries took their places in the march of commerce. A study of the development of the different lines would demonstrate the influence of the changing markets upon the character of the commodities produced. However, space does not permit, nor reader interest warrant such a study. Suffice it to say that the fundamental demands of life influenced the character of the factories construced. Some of the present stove foundries, for example, came into early existence. The Galusha Stove Co., headed by Norman Van Voorhis, chairman of the local committee in charge of arrangements for the convention in June, was established in 1853. The Co-operative Foundry Co., another stove and furnace manufacturing plant was established in 1867 by Nicholas Brayer the father of Frank N. Brayer, its present directing head. This latter firm, was of the character which its name implies, as the original stock under a capitaliza-

tion of $25,000 was apportioned among its employes on a co-operative basis.

All of the varied industries which have been noted in a sketchy fashion in this article will hold points of interest to those who attend the convention, and opportunities will be offered to become familiar with some of the exceptional attractions of the city and vicinity. Rochester has an extensive park system of eight units including three parks on Lake Ontario and three others on the Genesee river. Exposition park, where the exhibition and technical sessions of the American Foundrymen's association will be held, is unique among municipally controlled enterprises. It was acquired by the city through the purchase of an industrial prison and was extended and improved until with its 42 acres, nine large buildings including museum, library and shop school, it comprises a year-round recreation center of unusual merit. The exposition park is just eight minutes ride from the downtown section.

Other outlaying points of interest which may be reached by automobile or electric railway include Glen Haven and Sea Breeze, two summer resorts on Irondequoit bay, and Ontario Beach park, on Lake Ontario.

Exhibits To Show Advance of Industry

ABRASIVE INDUSTRY, Cleveland.—This booth will be fitted up as a rest room where all are invited to make their headquarters; represented by John A. Penton, A. O. Backert, J. D. Pease, D. M. Avey, H. E. Diller, Pat Dwyer, Charles Vickers, Charles J. Stark, Earl L. Shaner, Fred V. Cole, J. F. Ahrens, S. H. Jasper and Dann O. Taber.

ACHESON GRAPHITE CO., Niagara Falls, N. Y.—In this booth electrodes used in electric furnaces for metallurgical operations of all types will be shown, also various sizes of welding electrodes, foundry facing and cross sections of joints showing the details of machining necessary in making up electrodes for continuous feed. Representatives present will be as follows: Atwood B. Oatman, Fred E. O'Neil, Stanley L. Walworth and Lyman C. Judson.

AIR REDUCTION SALES CO., New York.—Automatic oxyacetylene welding and cutting machines for straight line and circle cutting of steel plates and forgings, equipment for cutting forgings, dies and shapes, hand holes and steam boiler headers, locomotive links and a tube welding machine will be exhibited. Hand welding and cutting torches for welding gray iron castings, steel and brass castings and for cutting cast-iron and steel, cylinders, and other accessories used in this industry also may be seen in this booth. Fred E. Rogers, H. Hazen, F. J. Leger and H. H. Melville will attend.

AJAX METAL CO., Philadelphia.—This exhibit will consist of a display of ingot metals, specimen castings and ball bearing alloys for babbitting. An electric furnace will be shown. Representatives are to be G. H. Clamer, W. J. Coane, Frank M. Willeson, Zeno D. Barns, C. F. Hopkins, Henry Gieseke, William Adams and Dudley Willcox.

ALLAN MFG. & WELDING CO., Buffalo.—

AMERICAN FOUNDRY EQUIPMENT CO., New York.—This company's exhibit will comprise sand cutting machines, sand blast, rotary-table room, gravity type, sand blast, tumbling barrel, cloth-screen type dust arrester, screen hopper type sand blast tank, jolt roll-over squeeze pattern draw molding machine, hammer core machine, corrugated steel flask, aluminum taper snap flask, pattern mounts and centers. Those who will attend follow: Verne E. Minich, Elmer A. Rich Jr., Royer S. Buch, James Rigby Jr., Hutton H. Haley, John Donald Alexander, Charles G. Smith, Jerome E. Sweet, C. B. Schneible, C. D. Steinmeier, E. J. Turnbull, David Logan, R. H. Moore, Philip S. Weiner and R. H. Kelley.

AMERICAN WOODWORKING MACHINERY CO., Rochester, N. Y.—

ARCADE MFG. CO., Freeport, Ill.—This exhibit will consist of hand and power machines in operation, a new type jolter with air-stripped, special piston ring squeezer, ordinary air squeezer, jolt squeezer and jolter. E. H. Morgan, Henry Tscherning, August Christen, R. E. Turnbull, L. L. Munn, Mentor Wheat and G. D. Wolfley will represent the company.

ARMSTRONG-BLUM CO., Chicago.—Metal band saws, automatic high speed hack saws, general work hack saws, all-steel punching, shearing, bending machine, rod cutters will comprise this display.

ASBURY GRAPHITE MILLS, Asbury, N. J.—This exhibit will comprise all grades of graphite and plumbago for foundry facing, lubricating and other purposes. Representatives will be H. M. Riddle, H. M. Riddle Jr., and I. D. Adams.

E. C. ATKINS & CO., Indianapolis.—Among the items in this display will be band saws, circular saws, machine knives, etc., for the pattern shop and woodworking foundry, also metal cutting saws for machine departments. The exhibit will be equipped with electric motors revolving the saws. Members of the organization present will be W. L. Sturtevant, B. D. Tompson, E. S. Norvell and T. A. Carroll.

AUSTIN CO., Cleveland.—This booth will be decorated with photographs and plans of foundry construction. O. D. Conover, G. A. Bryant Jr., C. F. Chard, H. L. Cornelison and H. E. Stitt will be present.

B. & J. MFG. CO., Springfield, O.—A working demonstration of a flask guide will be supervised by George E. Jackson.

BACHARACH INDUSTRIAL INSTRUMENT CO., Pittsburgh.—An entirely new recording instrument especially designed for the foundry and which will give a graphic record of both pressure and volume of air delivered on the same chart, will be exhibited. Also indicating blast meter, new type pressure indicator, wall type recorder, carbon dioxide indicator, and manometer will be shown. L. L. Vayda will be in charge of the exhibit.

BALBACH SMELTING & REFINING CO., New York.—This company will have a display representing its products, such as babbitt metal, alloys, brass ingots, etc.

BADGER TOOL CO., Beloit, Wis.

C. O. BARTLETT & SNOW CO., Cleveland.—Photographs and drawings of sand handling equipment for foundries, continuous molding and mechanical carrying equipment will comprise this display. Representatives are to be H. L. McKinnon, S. Gertz and Harry Orr.

BASIC MINERAL CO., Pittsburgh.—This company plans to exhibit minerals from their own mines. C. M. Miller and E. E. Miller will be present.

BASTIAN-BLESSING CO., Chicago.—Included in the contents of this booth will be welding and cutting apparatus, welding and cutting torches and safety regulators for welding and cutting.

BAUSCH & LOMB OPTICAL CO., Rochester, N. Y.—Metallurgical microscopes and metallographic apparatus will be found in this booth.

BEARDSLEY-PIPER CO., Chicago.—Tractor and turntable type, sand throwing molding machines will be demonstrated. E. O. Beardsley and E. L. Mitchell will be in charge.

BEAUDRY & CO., Boston.—A working model of power hammers arranged for motor drive will be in operation under the supervision of Archibald Parsons.

BETHLEHEM STEEL CO., Bethlehem, Pa.—Natural nickel-chrome-alloy pig iron will be shown together with a number of different types of castings made with this material added to the cupola mixture. These will include white iron for heavy wearing purposes, car wheels, oil engine castings, air compressor castings, gray iron castings, cylinder heads and pistons. Mining operation will be pictured. Robert MacDonald, H. P. Kreulen, D. A. Barkley, H. G. Walton and W. R. Shimer will represent the company.

S. BIRKENSTEIN & SONS, INC., Chicago.—This exhibit will consist of metals and castings, displayed by Louis Birkenstein, Harry Birkenstein, George Birkenstein, Frank McCaul, B. A. Shackelford, Louis Caviale, Eli Brown, Matt Schero and Charles B. Rapheal.

BLACK DIAMOND SAW & MACHINE WORKS, Natick, Mass.—Combined band saw filing and setting machines both belt and motor-driven, circular saw filing machine for wood and metal saws, band saw brazing outfit, band saw guide and flexible shafting will be exhibited. Representatives are to be Walter B. Ambler and P. P. Hubbard.

BLYSTONE MFG. CO., Cambridge Springs, Pa.—A sand mixer with screen and motor and power discharge will be on exhibition. E. F. Conroe and Ralph W. Barnes will represent the company.

BONNOT CO., Canton, O.—Informational data on powdered coal equipment and grinding machinery will be distributed by Stockton Harter, E. W. Steel and Charles Longenecker.

BRASS WORLD PUBLISHING CO., New York.—The booth occupied by this company will be fitted out as a rest room.

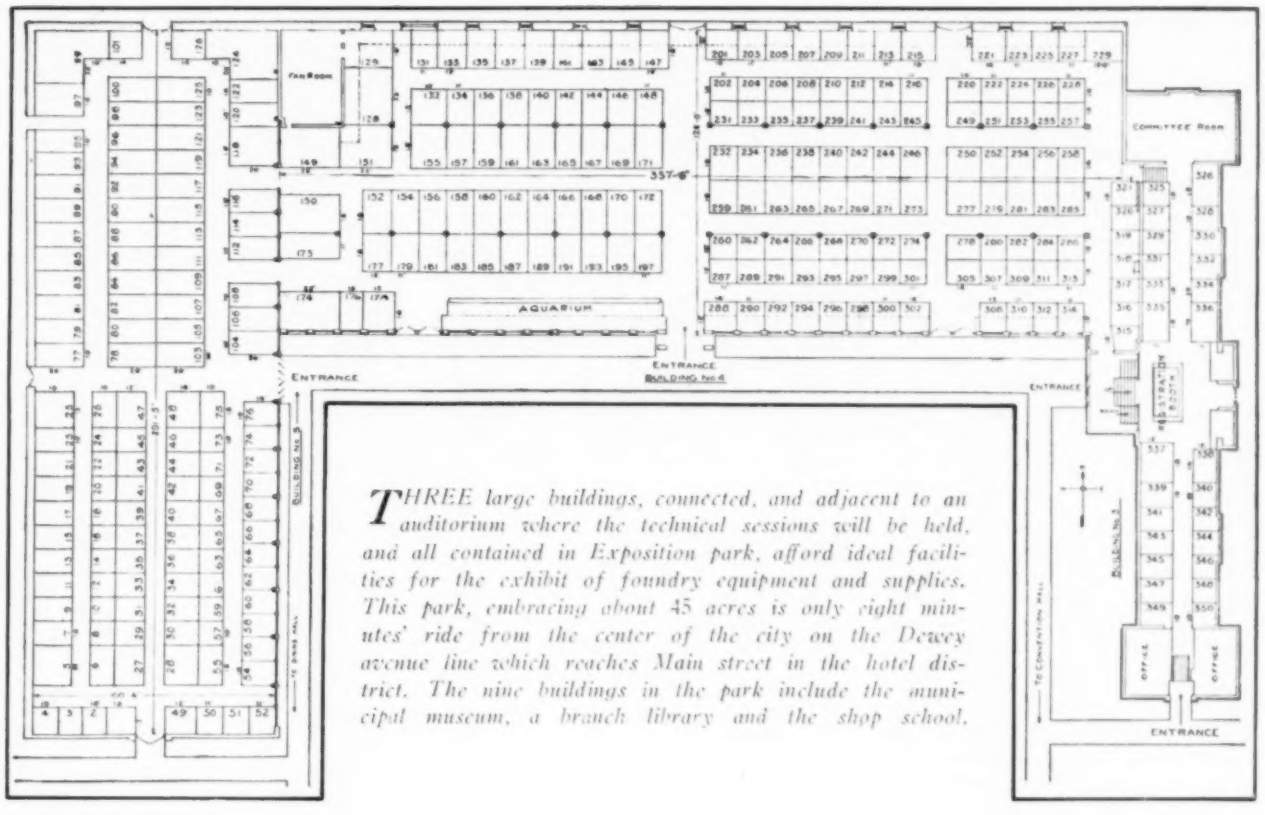
CARBORUNDUM CO., Niagara Falls, N. Y.—This company will show abrasive and refractory materials. Representatives present will be George S. Rogers, H. E. Kerwin, O. C. Dobson, S. F. Courter, J. A. King, C. E. Hawke and W. W. Sanderson.

FRANK D. CHASE, INC., Chicago.—Photographs and plans of buildings and foundries will be shown. Frank D. Chase, L. M. Hanson and Fred Graff will be the representatives.

CHICAGO CRUCIBLE CO., Chicago.—This company will exhibit graphite crucibles and other products.

CHICAGO PNEUMATIC TOOL CO., New York.—A 9 x 14 x 14-inch air compressor will be operated by this company. Chipping and riveting hammers of all sizes, air and electric drills, pneumatic and electric grinders, sand rammers for bench and floor work, pneumatic

Where To Find Exhibitors at Rochester Show



THREE large buildings, connected, and adjacent to an auditorium where the technical sessions will be held, and all contained in Exposition park, afford ideal facilities for the exhibit of foundry equipment and supplies. This park, embracing about 45 acres is only eight minutes' ride from the center of the city on the Dewey avenue line which reaches Main street in the hotel district. The nine buildings in the park include the municipal museum, a branch library and the shop school.

No. of Booth	Exhibitor
232, 234, 259, 261	*Abrasive Industry*
265	Acheson Graphite Co.
91, 93, 95	Air Reduction Sales Co.
308, 310, 312, 314	Ajax Metal Co.
19	Allan Mfg. & Welding Co.
20, 22, 24, 26, 39, 41, 43, 45, 47	American Foundry Equipment Co.
195	American Woodworking Machinery Co.
103, 105, 107	Arcade Mfg. Co.
165	Armstrong-Blum Mfg. Co.
251	Asbury Graphite Mills
162, 164	E. C. Atkins & Co.
300	Austin Co.
68	B. & J. Mfg. Co.
290	Bacharach Industrial Instrument Co.
329, 331	Balbach Smelting & Refining Co.
132	Badger Tool Co.
160	C. O. Bartlett & Snow Co.
242	Basic Mineral Co.
50 and 51	Bastian-Blessing Co.
268, 270	Bausch & Lomb Optical Co.
97, 99, 100	Beardsley-Piper Co.
257	Beaudry & Co., Inc.
179, 181	Bethlehem Steel Co.
340	S. Birkenstein & Sons, Inc.
243	Black Diamond Saw & Machine Wks.
193	Blystone Mfg. Co.
244	Bonnot Co.
286	Brass World Publishing Co.
150	Carborundum Co.
271, 273	Frank D. Chase, Inc.
317	Chicago Crucible Co.
124, 126	Chicago Pneumatic Tool Co.
328	Chas. J. Clark Blastmeter Co.
28, 30	Clark Tructractor Co.
176, 178	Cleveland Crane & Engineering Co.
288	Cleveland Flux Co.
149	Cleveland Pneumatic Tool Co.
245	Clipper Belt Lacer Co.
227, 229	Thomas E. Coale Lumber Co.
206, 235	Cochrane-Bly Co.
254	F. A. Coleman Co.
295	Combined Supply & Equipment Co.
232, 234, 259, 261	*Daily Metal Trade*
10-12	Davenport Machine & Foundry Co.
6	Dayton Pneumatic Tool Co.
256, 258	Debevoise-Anderson Co.
14, 16, 35, 37	Wm. Demmler & Bros.
66	Detroit Electric Furnace Co.
158	Henry Disston & Sons
260, 262	Joseph Dixon Crucible Co.
214, 216	Doehler Die Casting Co.
77, 79	Electric Furnace Co.
294	Electro Refractories Corp.
74, 76	Federal Malleable Co.
232, 234, 259, 261	The Foundry
238	Foundry Equipment Co.
87, 89	General Electric Co.
34	Globe Iron-Crush & Shot Co.
57	Robert Gordon, Inc.
59, 61	Grimes Molding Machine Co.
155	Hanna Engineering Works
284	Clement Hardy Co.
191	R. G. Haskins Co.
152, 154	Hayward Co.
115, 117	Herman Pneumatic Machine Co.
131	High Speed Hammer Co.
281	Hill & Griffith Co.
109, 111	Hoevel Mfg. Corp.
298	Holcroft & Co.
189	Hyatt Roller Bearing Co.
137, 139	Independent Pneumatic Tool Co.
225	Industrial Controller Co.
128, 139	Ingersoll-Rand Co.
67, 69	International Molding Machine Co.
277, 279	*Iron Age*
232, 234, 259, 261	*Iron Trade Review*
311, 313	Spencer Kellogg & Sons, Inc.
252	Kuehnle, Inc.
202	H. M. Lane Co.
237	Lava Crucible Co.
249	Leeds & Northrup Co.
173	Link Belt Co.
272, 274, 299, 301	David Lupton's Sons Co.
231, 233	J. S. McCormick Co.
261	*Machinery*
338	MacLean Publishing Co.
5	Macleod Co.
75	Malleable Iron Fittings Co.
225	Mechanical Appliance Co.
55	Menefee Foundry Co.
334	*Metal Industry*
302	Metal & Thermit Corp.
250	Michigan Smelting & Refining Co.
292	Mills, Rhines, Bellman & Nordhoff
64	Modern Pouring Device Co.
36	Moline Iron Works
78, 80, 82	Monarch Engineering & Mfg. Co.
114, 116	National Engineering Co.
42, 44, 46, 48	Wm. H. Nicholls Co., Inc.
266	Norma Company of America
136	Northern Blower Co.
169, 171	S. Obermayer Co.
221	Ohio Body & Blower Co.
156	George Oldham & Sons Co.
118, 120, 122	Osborn Mfg. Co.

Where To Find Exhibitors at Rochester Show

(Concluded from page 407)

No. of Booth	Exhibitor
58, 60, 62	Oxweld Acetylene Co.
141, 143, 145, 147	Pangborn Corp.
267	J. W. Paxson Co.
232, 234, 259, 261	Penton Publishing Co.
282	Charles E. Pettinos
210	Geo. F. Pettinos
337	Pickands, Brown & Co.
287	Pittsburgh Electric Furnace Corp.
135	Porcelain Enamel & Mfg. Co.
40	Portage Silica Co.
84, 86	Henry E. Pridmore, Inc.
157, 159	Racine Tool & Machine Co.
283, 285	Richards-Wilcox Mfg. Co.
174	Rogers, Brown & Co.
108	P. H. & F. M. Roots Co.
54, 56	Royer Foundry & Machine Co.
208	Sabin Machine Co.
265	Safety Equipment Service Co.
151	Shepard Electric Crane & Hoist Co.
167	Simonds Mfg. Co.
7	Skinner Bros. Mfg. Co., Inc.
119, 121, 123, 125	W. W. Sly Mfg. Co.
278, 280, 305, 307	Werner G Smith Co.
21	Spencer Turbine Co.
1, 2, 3, 4	Sterling Wheelbarrow Co.
——	W. F. Stodder
83, 85	Sullivan Machinery Co.
81	Superare Welding Machine Co.
140, 142, 144, 146, 148	Syracuse Supply Co.
27, 29, 31	Tabor Mfg. Co.
293	W. P. Taylor Co.
236	Taylor Instrument Companies
9	R. J. Teetor Co.
90, 92, 94, 96, 98, 100	Truscon Steel Co.
297	United Compound Co.
309	United States Graphite Co.
246	United States Silica Co.
49	Vibrating Machinery Co.
197	Wadsworth Core Machine & Equipment Co.
326	H. L. Wadsworth
177	J. D. Wallace & Co.
204	Wayne Oil Tank & Pump Co.
183, 185	Westinghouse Electric & Mfg. Co.
25	Westinghouse Traction Brake Co.
269	White & Bro., Inc.
71, 73	Whitehead Bros. Co.
166, 168, 170, 172	Whiting Corp.
201, 203, 205, 207, 209, 211, 213, 215	E. J. Woodison Co.
163	T. B. Wood's Sons Co.
104, 106	Young Bros. Co.

geared and cylinder hoists, air hose, hose couplings, and miscellaneous accessories will be shown in addition.

CHARLES J. CLARK BLASTMETER CO., Gladbrook, Iowa.—Volume and velocity meters and pressure gages will be shown by this company which will be represented by B. I. Harms.

CLARK TRUCTRACTOR CO., Buchanan, Mich.—In this company's booth will be exhibited a 72-inch wheel base tractor, lift-trucks, and hand hoists end dump body. A moving picture machine will show tractors at work. Representatives will be L. J. Schneider, J. W. Taylor, G. M. Chase and W. B. Eldred.

CLEVELAND CRANE & ENGINEERING CO., Wickliffe, O.—A tramrail train operated electrically with push button control, applicable for use in foundries in connection with the handling of molds from molding machines or from benches to the floor and also used in connection with pouring of molds in one-man systems, will be the principal feature of this exhibit. To illustrate the flexibility of the equipment, 100 feet of tramrail will be installed and suspended from this will be a carrier with an electro magnet. Information will be distributed on the large type cranes. Representatives will include L. E. Falon, F. J. Brittingham, A. F. Anjenkey, D. T. Laylin, H. G. Webb, W. C. Heinle, William G. Wehr, E. T. Bennington, C. C. Robbins and J. B. Shaver.

CLEVELAND FLUX CO., Cleveland.—A complete line of fluxes including a brass casting cleaner will be displayed under the auspices of Clifford B. Cornell, Loren E. Souers, David B. Baxter, James A. Rice and Elizabeth C. Weisblat.

CLEVELAND PNEUMATIC TOOL CO., Cleveland.—Riveting hammers, air drills, compound and plain geared and breast and rotary types, sand rammers, for flask, bench and floor work, portable grinders, core breakers, chipping hammers, air valves, jarring machines and pipe bending machines will be shown. Representatives are to be H. S. Covey, A. Scott, J. T. Graves, C. D. Garner and G. Gregory.

CLIPPER BELT LACER CO., Grand Rapids, Mich.—Belt lacers, belt hooks, rawhide pins and various types of laced belts will be shown by this company. Carl P. Field will be in charge.

THOMAS E. COALE LUMBER CO., Philadelphia.—Pattern lumber including Michigan soft cork white pine and California sugar pine are to be exhibited.

COCHRANE-BLY CO., Rochester, N. Y.—A metal sawing machine, an automatic saw sharpening machine, vertical millers and shapers and filing machine will be shown in charge of W. H. Welch.

F. A. COLEMAN, Cleveland.—A booth will be equipped by this company for use as a rest room with F. A. Coleman present to meet visitors.

COMBINED SUPPLY & EQUIPMENT CO., Buffalo, N. Y.—This exhibit will be devoted mainly to double and angle stem chaplets. Those in charge will be S. De Vinness Jr., and C. L. Jackson.

DAILY METAL TRADE, Cleveland.—This booth will be fitted up as a rest room where all are invited to make their headquarters; represented by John A. Penton, A. O. Backert, J. D. Pease, D. M. Avey, H. E. Diller, Pat Dwyer, Charles Vickers, C. J. Stark, E. L. Shaner, Dann O. Taber, Fred V. Cole, J. F. Ahrens and S. H. Jasper.

DAVENPORT MACHINE & FOUNDRY CO., Davenport, Iowa.—Jolt roll-over pattern draw machines and jolt stripper machines will be included in this exhibit. Carl Falk, A. V. Magnuson, J. T. Anderson, A. D. Zicbarth will be the representatives present.

DAYTON PNEUMATIC TOOL CO., Dayton, O.

DEBEVOISE ANDERSON CO., New York.—Included in the equipment of this booth will be samples of pig iron, coal and coke under the auspices of Mills Anderson, W. K. Callow and A. E. Kelly.

WM. DEMMLER & BROS., Kewanee, Ill.—An air-operated core machine will be demonstrated by H. L. Demmler and F. A. Demmler.

DETROIT ELECTRIC FURNACE CO., Detroit.—Materials manufactured in electric furnaces together with literature, photographs and general information will be installed in this booth. A continuous operation of a 1-ton electric furnace will be a feature. Those in attendance will be E. L. Crosby, E. T. Gushee, H. M. St. John and A. E. Rhoads.

HENRY DISSTON & SONS, Philadelphia.—This company will exhibit a metal cutting machine in operation. Various types of saws for cutting several kinds of metal will be displayed.

JOSEPH DIXON CRUCIBLE CO., Jersey City, N. J.—This exhibit will contain graphite products in charge of R. F. Leonard and R. R. Belleville, C. A. Shaw and R. H. Brinkerhoff.

DOEHLER DIE CASTING CO., Brooklyn, N. Y.—Various die-cast products will be shown.

ELECTRIC FURNACE CO., Alliance, O.—A full sized foundry furnace will be at work melting and pouring brass. This unit will be a 50-kilowatt electric tilting type with 500 to 600 pounds hearth capacity. The exhibit will be complete with switch and transformer, meters and all necessary equipment for a complete foundry installation.

ELECTRO REFRACTORIES CORP., Buffalo, N. Y.

FEDERAL MALLEABLE CO., West Allis, Wis.—This will be a working exhibit of squeeze stripper and other types of molding machines, in charge of L. C. Wilson, K. H. Siemens and W. J. MacNeil.

THE FOUNDRY, Cleveland—This booth will be fitted up as a rest room where all will be invited to make their headquarters; represented by John A. Penton, A. O. Backert, J. D. Pease, D. M. Avey, H. E. Diller, Pat Dwyer, Charles Vickers, C. J. Stark, E. L. Shaner, Dann O. Taber, F. V. Cole, J. F. Ahrens and S. H. Jasper.

FOUNDRY EQUIPMENT CO., Cleveland.—Photographs of actual installations of core and mold ovens and brass and aluminum melting furnaces will be displayed. Car-type, portable rack-type, and rolling drawer ovens also will make up the exhibit. C. A. Barnett, R. W. Bronson, M. A. Beltaire Jr., and S. D. Rickard will represent the company.

GENERAL ELECTRIC CO., Schenectady, N. Y.—A 50-pound crucible melting furnace with automatic control panel and transformer and portable semiautomatic arcwelding equipment operated by a 200-ampere portable motor-generator set with necessary starting and control panel will be demonstrated.

GLOBE IRON-CRUSH & SHOT CO., Mansfield, O.—High carbon chilled shot for sand blasting purposes will make up this book. Those in charge will be E. O. Townsend and L. A. Cline.

ROBERT GORDON, INC., Chicago.—This exhibit will consist of a ¼-size working model of a mechanical hot blast heater showing the operation of this unit for foundry heating and photographs of installations. Those in charge will be T. H. Monaghan, A. L. Weixel, J. L. Zimmerman and R. M. Zimmerman.

GRIMES MOLDING MACHINE CO., Detroit.—This company expects to exhibit a hand rammed rollover molding machine and a 2500-pound capacity jar ram rollover molding ma-

chine. George L. Grimes and Charles J. Skeffington will be the representatives.

HANNA ENGINEERING WORKS, Chicago.—A cross section of the pneumatic cylinder hoist showing piston and piston rod features, also a cross sectional photograph of an air jolt machine, I-beam trolleys and vibrators will be displayed. Representatives present will include A. F. Jensen, J. C. Hanna, O. F. Weiss and J. O. Clark.

CLEMENT HARDY CO., Chicago.—Photographs of plants constructed by this company, including foundries for the Defiance Machine Works and the Hercules Gas Engine Co., will be shown.

R. G. HASKINS CO., Chicago.—Flexible shaft equipment and portable tools will be exhibited by the company's representative, R. G. Haskins.

HAYWARD CO., New York.—An exhibit will be made of working models of clamshell and orangepeel buckets and an electric motor bucket of this type also will be shown in operation. In addition to the foregoing equipment, a collection of photographs illustrating this company's machines in operation in foundries and other industries will be displayed.

HERMAN PNEUMATIC MACHINE CO., Pittsburgh.—A small working model of independent rollover and pattern drawing machine are to be exhibited. Robrt F. Ringle, I. J. Oesterling, R. P. Morgan, Robert Porteous, C. W. Miller, C. S. McMath, W. W. Hughes, Thomas Kaveny, A. G. Doyle and R. Harris will represent the company.

HIGH SPEED HAMMER CO., Rochester, N. Y.—In addition to exhibiting different sizes of high speed riveting hammers, this company will give actual demonstrations. H. A. Moore will be in charge.

HILL & GRIFFITH CO., Cincinnati.—This booth will be fitted up as a rest room with John Hill, William Oberhelman, Bruce Hill and C. L. Gisin present to receive visitors.

HOEVEL MFG. CORP., Jersey City, N. J.—This display will consist of dustless, self-contained, automatic, sand-blast machines comprising an 88-inch table machine, 32 x 40 barrel machine in operation, sand-blast tank, injector and injector sand blast. J. M. Betton, L. V. Patmore and F. Welte will be in charge.

HOLCROFT & CO., Detroit.—Photographs, drawings and technical data on metallurgical furnaces with special attention to electrical furnaces will comprise this exhibit, which will be in charge of Charles T. Holcroft and H. L. Ritts.

HYATT ROLLER BEARING CO., New York.—A complete line of bearings for cranes, trolleys, hoists, trucks, conveyors, sand mixing machinery, machine tools, cars, power transmission lines and other foundry equipment are to be shown. An electrically operated model demonstrating a bearing enclosed in glass will supply a visual demonstration of a positive oiling action. Representatives will include D. Gleisen, W. B. Wachtler, John F. McGuinness and F. H. Knight.

INDEPENDENT PNEUMATIC TOOL CO., Chicago.—Developments and inventions in machine tool equipment for foundry purposes will be shown; representatives present will include R. T. Scott, H. G. Keller, F. H. Charbono, F. J. Passino, S. W. Lanham, H. F. White and A. Anderson.

INDUSTRIAL CONTROLLER CO., Milwaukee.—Manually operated and automatic alternating current compensators and automatic, across-the-line type, alternating-current starters will be demonstrated. The automatic apparatus will be equipped with remote control push buttons and time element control stations. Compensators and starters are equipped with low voltage and overload protective devices. J. H. Burroughs and R. G. Kellogg will be in attendance.

INGERSOLL-RAND CO., New York.—This company will show a 2-stage 11 x 7 x 10-inch stroke air compressor with short belt drive, a 100-pound pressure machine with 300-foot cubic capacity, also pneumatic tools including sand rammers, portable pneumatic grinder, air driven wire brushes for cleaning castings, shipping hammers, air motor hoist, air drills and riveting hammers.

INTERNATIONAL MOLDING MACHINE CO., Chicago.—Combination power, turnover machines, combination jolt-stripping machines, hand turnover and special machines for core work will be installed. Edward A. Pridmore, S. W. Hamel and E. G. Borgnis will be in charge.

IRON AGE, New York.—

IRON TRADE REVIEW, THE, Cleveland.—This booth will be fitted as a rest room where all are invited to make their headquarters; represented by John A. Penton, A. O. Backert, J. D. Pease, D. M. Avey, H. E. Diller, Pat Dwyer, Charles Vickers, C. J. Stark, E. L. Shaner, Dann O. Taber, Fred V. Cole, J. F. Ahrens and S. H. Jasper.

SPENCER KELLOGG & SONS, INC., Buffalo, N. Y.—Samples of core oils and cores will be shown. This exhibit will be in charge of W. L. Goetz, J. N. Yaeger, Enos G. Allen, George B. Chase and M. B. Nordlie.

KUEHNLE, INC., Philadelphia.—Cores and oils in different grades, trade marks and advertising material will be shown. Albert C. Kuehnle, James A. Burk and E. M. Satterthwaite will be in charge.

H. M. LANE CO., Detroit.—The booth of this company will be fitted up with photographs and drawings of industrial plants. H. M. Lane, A. O. Thomas and G. Pitt will be in charge.

LAVA CRUCIBLE CO., Pittsburgh.—This exhibit will consist of samples of crucibles, furnace cement and metal flux. Representatives will be Paul L. Berkey, Furman South Jr., D. E. MacLean and A. J. Gloekler.

LEEDS & NORTHRUP CO., Philadelphia.—The display of this company will include potentiometers, pyrometers, of both indicating and recording types including the two-couple hot and cold zone temperature recorder which is suited particularly to the control of temperatures in malleable iron annealing ovens. O. Brewer and E. B. Estabrook will be present.

LINK-BELT CO., Chicago.—This exhibit will consist of a revivifier and an electric hoist under the auspices of A. G. J. Rapp.

DAVID LUPTON'S SONS CO., Philadelphia.—Pivoted, counter balanced and continuous sash operating devices and steel factory equipment are among the items to be displayed. A model of a foundry building with patented truss roof design will be a feature. Those who will represent the company include Clarke P. Pond, Charles F. P. Buckwalter, J. H. Throm, G. N. Hingston and C. A. Bockius.

J. S. McCORMICK Co., Pittsburgh.—This exhibit will include some new equipment in addition to foundry facings supplies, etc. Representatives will be J. S. McCormick, T. E. Malone, S. R. Costley, E. M. Lewis and George Somerhalder.

MACHINERY, New York.—

MacLEAN PUBLISHING CO., Toronto, Ont.—This booth will be fitted up as a rest room; representatives, B. G. Newton, G. M. Smith, W. L. Gifford, A. H. Byrne and S. S. Moore.

MACLEOD CO., Cincinnati.—Sand blast tumbling barrels, sand blast hose machine, a model of dust arresters and oil burning equipment will be displayed. James Lauder and Alfred Anderson will be in charge.

MALLEABLE IRON FITTINGS CO., Branford, Conn.—A working exhibition of a vibrator riddle will be shown together with a line of accessories. G. B. Pickop will have charge.

MECHANICAL APPLIANCE CO., Milwaukee.—Included in this exhibit will be a 1½-horsepower, 3600 revolution per minute motor, a ½-horsepower 1200 revolutions per minute, and a 10-horsepower, 1800 revolutions per minute, ball bearing motors of interest to foundry operators and also motors connected to machines of other exhibitors. W. B. Crabtree will be the representative.

MENEFEE FOUNDRY CO., Fort Wayne, Ind.—This company will show and demonstrate a pattern compound and patterns made from it.

METAL INDUSTRY, New York.—The booth occupied by this company will be fitted out as a rest room.

METAL AND THERMIT CORP., New York.—Transparencies and photos showing various applications of thermit for welding and demonstrations of the use of thermit for pipes, will be displayed. Arthur A. Braid and J. W. Wilson will attend.

MICHIGAN SMELTING & REFINING CO., Detroit.—Noncorrosive bronze high tensile strength which can either be forged, cast or extruded will be exhibitd. Brass and bronze ingots together with castings made from each grade, also babbitt, solders and white metal die castings will be seen at the booth; representatives, John R. Searles, Norman Sillman, Henry Levitt, B. P. Cooke, C. L. Hall, J. P. Tiernan and R. R. Arnold.

MILLS, RHINES, BELLMAN & NORDHOFF, Toledo, O.—This exhibit will be constituted mainly of blue prints of foundries, forge shops and machine shops, photographs showing completed buildings together with illustrations of plants and types of buildings. Estimating data will be distributed. Representatives follow: George S. Mills, George V. Rhines, John Gillett and Morris Hobbs.

MODERN POURING DEVICE CO., Pt. Washington, Wis.

MOLINE IRON WORKS, Moline, Ill.—Squeezer molding machines will comprise this company's exhibit. B. V. Nutt will be in charge.

MONARCH ENGINEERING & MFG. CO., Baltimore, Md.—This company will exhibit special tilting crucible furnaces, foundry cupolas, sand mixers, core ovens, soft metal furnaces, oil pumps, pressure blowers, hardening and annealing furnaces, ladle heaters, etc. The representatives will be Frank Maujean, James V. Martin, Lees Hall, William Raber, I. D. Adams and H. D. Harvey.

NATIONAL ENGINEERING CO., Chicago.—Three different sizes of sand mixer will be in operation. Those representing the company will be H. S. Simpson, S. A. Cleland, C. J. Skeffington and Garney Castor.

WM. H. NICHOLLS CO., INC., Brooklyn, N. Y.—This company will show its line of molding machines.

NORMA CO. OF AMERICA, Long Island City, N. Y.—Displays of precision ball bearings, roller journal bearings and ball thrust bearings will occupy the booth of this company. F. W. Mesinger and R. E. Hecker will be present.

NORTHERN BLOWER CO., Cleveland.—This company will display two types of dust arrestors, a sand blast room, blow pipes and blowers in charge of M. E. Eiben and E. J. Moore.

S. OBERMAYER CO., Chicago.—Cements both dry and plastic with photographs and demonstration of partings will comprise this company's exhibit. H. D. Barker, J. E. Evans, W. C. Samuals, J. L. Cummings, A. J. Beckman, William Lawson, E. D. Frohman, S. T. Johnson and Theodore Hoffman will represent the company.

OHIO BODY & BLOWER CO., Cleveland.—Demonstrations will be made of portable type core ovens, rack type core ovens, aircrafts and separators. C. F. Mayer and W. E. Clement will represent the company.

GEORGE OLDHAM & SONS CO., Philadelphia.—Chipping hammers, foundry rammers

and core breaking equipment will be exhibited by this company.

OSBORN MFG. CO., Cleveland.—Rollover jolt machine, electrically operated with pattern draw, electrically-operated, flask filling machine, jolt squeezers, plain air squeezers, hand operated rollover machine and hand operated stripper machine will be displayed. Representatives include Franklin G. Smith, H. R. Atwater, E. S. Carman, E. T. Doddridge, J. C. Alberts, R. E. Kiefer, F. T. Spikerman, H. E. Deakins and M. R. Atwater.

OXWELD ACETYLENE CO., Newark, N. J.—Welding and cutting apparatus, acetylene generators, supplies, educational features, demonstrations of welding and cutting, incidental to foundry needs and cutting iron may be seen at this booth.

PANGBORN CORP., Hagerstown, Md.—Sandblast equipment, both stationary and in operation, including barrel sand blast, cabinet sand blast, cabinet table sand blast, sand blast room, hose machine portable sand blast and a new model dust arrester will be shown. Those in charge will be Thomas W. Pangborn, John C. Pangborn, P. J. Potter, F. J. Hull, George A. Cooley, Jesse J. Bowen, Roy C. Koch, Charles T. Bird, W. C. Lytl and H. D. Gates.

J. W. PAXSON CO., Philadelphia.—Showing foundry supplies and molding sands, this company will be represented by H. M. Bougher, J. F. Gachring, C. B. Somers and I. F. Kremer.

PENTON PUBLISHING CO., Cleveland.—This booth will be fitted up as a rest room where all are invited to make their headquarters; represented by John A. Penton, A. O. Backert, J. D. Pease, D. M. Avey, H. E. Diller, Pat Dwyer, Charles Vickers, C. J. Stark, E. L. Shaner, Dana O. Taber, Fred V. Cole, J. F. Ahrens and S. H. Jasper.

CHARLES E. PETTINOS, New York.—A complete line of molding sand, foundry plumbago blacking and various grades of graphite are to be on exhibition. Charles Pettinos, M. M. Housekeeper, Marshall M. Housekeeper and J. Howard Bing are to be present.

GEO. F. PETTINOS, Philadelphia.—Molding sand, foundry facings and blackings, other graphite products and foundry supplies will be shown. George F. Pettinos, H. B. Taylor, James H. Hatten and H. I. Graves will attend.

PICKANDS, BROWN & CO., Chicago.—Will display samples of coke and iron.

PITTSBURGH ELECTRIC FURNACE CORP., Pittsburgh.—This exhibit will consist of photographs and pictures of electric furnaces and castings which have been produced.

PORCELAIN ENAMEL & MFG. CO., Baltimore.—Miniature porcelain enameling equipment will be enameling cast iron at this exhibit.

PORTAGE SILICA CO., Youngstown, O.—Conglomerate rock in its natural state and samples of finished sand-blast sand, steel molding and core sands will be shown. E. E. Khoss, L. R. Farrell and C. F. Eberhart will be in charge.

HENRY PRIDMORE, INC., Chicago.—Included in this exhibit will be a 10-inch draw combination, electric-jolt, power-rockover drop machine with mounted patterns, a 16 x 20-inch to 8-inch draw combination electric jolt strip machine with mounted pattern, a 2 to 10 x 12-inch square sand machine with mounted brakeshoe patterns and a 14 x 16-inch to 5-inch drop rockover drop machine with patterns. Representatives will be Mrs. Henry E. Pridmore, Henry A. Pridmore, Marshall E. Pridmore, D. F. Eagan, C. H. Ellis and Henry G. Schichter.

RACINE TOOL & MACHINE CO., Racine, Wis.—High speed metal cutting machines, broach slotters and keyseaters will make up the contents of the booth.

RICHARDS-WILCOX MFG. CO., Aurora, Ill.—This exhibit will include overhead conveying tracks of both trolley and I-beam types, switches, cross overs, ball bearing trolleys, ball bearing traveling cranes and chain blocks. A. J. Eggleston, E. J. G. Phillips, H. R. Butler, W. W. O'Brien and R. F. Murphy will be the representatives present.

ROGERS, BROWN & CO., Cincinnati.—An electrically operated map showing the location of blast furnaces, coke ovens, iron ore and fluor spar mines as well as the location of other points to which the company ships various commodities, will be seen at this booth. Those who will attend are R. W. Clark, George R. Sullivan, H. W. Fernald, Thomas A. Wilson, Harwood Wilson, A. F. Stengel, W. R. Maher, F. W. Bauer and J. R. Morehead.

P. H. & F. M. ROOTS CO., Connersville, Ind.—The list of equipment to be exhibited includes a foundry type blower for operation in connection with foundry cupolas, a charging hoist, flask guides and wind gates. Representatives follow: H. M. Papworth, W. H. Morgan, D. R. Schively, E. A. Overhiser, H. Snyder and Paul Diver.

ROYER FOUNDRY & MACHINE CO., Wilkes Barre, Pa.—

SABIN MACHINE CO., Cleveland.—One man trucks and steel factory barrels, both straight and tapered, will be seen at this booth. H. B. Sabin, O. T. Sabin and A. A. Dotod will represent the company.

SAFETY EQUIPMENT SERVICE CO., Cleveland.—Safety devices including goggles, sand blast helmets, fireproof and asbestos gloves, leggings, welding helmets, safety danger signs and first aid equipment will be shown. C. W. Nutt and H. L. Woods will represent the company.

SHEPARD ELECTRIC CRANE & HOIST CO., Montour Falls, N. Y.—This exhibit will consist of small cranes, electric hoists mounted on I-beams, including a demonstration of the ease with which roller bearing trolleys push along the runway. In charge of the demonstration will be R. H. McGredy, F. A. Hatch, G. L. Drake, J. E. La Tourrette and H. H. Hickman.

SIMONDS MFG. CO., Fitchburg, Mass.—In this booth will be seen metal saws, hack saw blades and files and an inserted-tooth, metal cutting-off saw will be shown machine cutting steel bars; representatives, H. B. McDonald and H. A. Schulte.

SKINNER BROS. MFG. CO., INC., St. Louis.—A motor-driven, 4 x 4-foot heater for heating foundries and industrial plants will be shown in operation. This apparatus exhausts cold air from the foundry floor in cold weather and forces it up through a set of pipe coils and out through a directing elbow outlet. E. V. D. Wallace will be in attendance.

W. W. SLY MFG. CO., Cleveland.—A complete sand blast room installation including pressure tank, sand elevator and dust arrester will be constructed so that an observer can see the process through glass illustrating the elevation of sand, its preparation, catching the dust and returning the abrasives to the tank. A tilted sand blast mill, a sand blast cabinet, horizontal sand blast mill and a steel core oven, a table of model tumbling mills will also be displayed. Representatives will be S. C. Vessy, F. W. Klatt, F. A. Ebeling, D. L. Harris, C. P. Guion, D. P. Carter, J. L. Battenfeld, J. W. Dopp, H. J. Felsburg, J. D. Turner, M. A. Schnaedelbach and R. W. Hasselle.

WERNER G. SMITH CO., Cleveland.—Samples of core oils and specimens of cores made from oils manufactured by this company will be on exhibition. The following men will be present: Werner G. Smith, Milton S. Finley, Frank H. Grace, Frank H. Dodge, L. P. Robinson, William E. Rayel, E. H. Hartlein, Louis F. Ferster.

SPENCER TURBINE CO., Hartford, Conn.—This company will show turbo compressors, featuring equipment for use with cupolas and also for oil burning brass melting furnaces. Those expected to be present will be H. M. Grossman, Willard G. Cross and S. E. Phillips.

STERLING WHEELBARROW CO., West Allis, Wis.—A complete line of wheelbarrows and flasks with a testing machine in operation, a wheelbarrow loaded with 650 pounds mounted over a 42-inch pulley running at 32 revolutions per minute, will be demonstrated.

W. F. STODDER, Syracuse, N. Y.—

SULLIVAN MACHINERY CO., Chicago.—This company will exhibit short belt connected air compressors, single stage belt driven air compressors, compressed air forge hammer in operation and core breakers. Representatives will be Chester D. Cummings, Alden L. Colvill and Alexander Milne.

SUPERARC WELDING MACHINE CO., Detroit.—

SYRACUSE SUPPLY CO., Syracuse, N. Y.—Lathes, shapers, radial drills, milling machines and miscellaneous machine shop equipment will be in operation.

TABOR MFG. CO., Philadelphia.—A complete line of molding machines, including squeezers, jar squeezers, jar strippers, pattern machines and jar rollovers can be seen at this booth. The representatives are to be Wilfred Lewis, H. W. Brown, J. T. Ramsden, H. W. Impey, John Fendner, E. S. Lewis, W. E. Sewell, J. H. Coleman, T. L. Sumner and P. J. Shire.

W. P. TAYLOR CO., Buffalo.—Small, high grade electric steel castings of various types will comprise this display. The company will be represented by C. D. Taylor, James W. Gibney and W. J. Gibney.

TAYLOR INSTRUMENT COMPANIES, Rochester, N. Y.—A complete line of electrical pyrometers for foundry work, also recording and indicating thermometers for core ovens will be shown. H. B. Brown, G. A. Howell, A. A. Sandy, J. J. Kimmel, C. B. Carbon and J. W. Schwarz will be representatives present.

R. J. TEETOR CO., Cadillac, Mich.—Suspended type molding machines in operation will be seen at the booth of this company which will be in charge of C. W. Eyke.

TRUSCON STEEL CO., Youngstown, O.—The exhibit will consist of pressed steel foundry flasks; a pressed steel platform for lift trucks; photographs and layouts of various types of industrial buildings, and side wall steel windows, top hinge continuous monitor steel sash and a tension operating device.

UNITED COMPOUND CO., Buffalo, N. Y.—Vent and pattern wax and corrugated gaggers will comprise this exhibit in charge of W. F. Bradley and L. F. Leney.

UNITED STATES GRAPHITE CO., Saginaw, Mich.—Included in the exhibit of this company will be various grades of plumbago and foundry facing manufactured from pure natural graphite. Other graphite products such as air floated graphite, greases, and carbon brushes will be shown. Those in charge will be G. D. Robinson, R. J. Edminston and C. D. Mackintosh.

UNITED STATES SILICA CO., Chicago.—Samples of shot for sand blasting and silica for steel molding, samples of castings will be exhibited. Volney Foster, Lewis B. Reed, H. F. Goebig and T. S. Rogers will be in charge.

VIBRATING MACHINERY CO., Chicago.—Riddles with automatic discharge of tailings will be exhibited in this booth. Julius Schroeter, Arthur Piepjohn and William Lindsay will represent the company.

WADSWORTH CORE MACHINE & EQUIPMENT CO., Akron, O.—A coremaking

machine and core cutting off coning machine and various sizes of all steel floor plates and bottom plates are to be exhibited.

WADSWORTH SAND CUTTER, Cleveland.—Motion pictures of operating machinery will be shown under the supervision of H. L. Wadsworth, H. B. Fay and K. F. Barrow.

J. D. WALLACE & CO., Chicago.—Portable bench tools for use in the pattern shops and foundries will be shown. Among the improved equipment will be a 16-inch band saw of the splash lubrication type which oils the bearings by centrifugal force, the gears running in oil. An automatically controlled glue pot which maintains the temperature of the glue constant at 150 degrees and is equipped with a thermostat which automatically cuts off the current when the proper tempertature has been attained and, when the temperature has droppd 5 degrees, the connection is made to increase the heat, is to be displayed. Those in attendance will be J. D. Wallace, C. J. Rennie, A. N. Frecker, William Uhlhorn, C. E. Ward, A. M. Andresen and F. W. Andresen.

WAYNE OIL TANK & PUMP CO., Fort Wayne, Ind.—This exhibit will comprise a stationary, pit-type crucible melting furnace with air pre-heater, a ladle heater, portable wheel tank for core oil, automatic interlocking fuel cutoff valve and high and low pressure oil and gas burners. R. P. Maynard will be in charge.

WESTINGHOUSE ELECTRIC & MFG. CO., Pittsburgh.—The booth to be occupied by this company will be fitted out with industrial products including machine shop equipment and supplies, among which will be an 175-ampere portable arc-welding set in operation, industrial automatic controllers of alternating and direct current type demonstrating the interchangeability of parts. Industrial motors in operation also will be a part of the exhibit. W. W. Reddi, A. M. Candy, Paul Orr, F. D. Egan and A. M. Turner will represent the company.

WESTINGHOUSE TRACTION BRAKE CO., Pittsburgh.—The principal items to be shown are a 335-cubic foot piston displacement, motor-driven air compressor driven from a 50-horsepower, 3-phase, 60-cycle, 220-volt alternating current motor through herringbone gear and pinion including automatic water control valve mounted on a common bed plate. A main reservoir enameled inside and out designed for a working pressure of 140 pounds per square inch including drain cock single pointer air gage and safety valve also will be exhibited. Those in attendance will be M. H. Burchard, O. H. Miller, J. F. Ames, S. A. King and F. C. Young.

WHITE & BRO., INC., Philadelphia.—Metals, comprising composition and yellow ingot brass, manganese bronze, casting copper and white metals will be shown. G. Horace Krider, L. D. Kluver, Raymond Hunter, Harold Reinhardt, C. B. White and Frank Krug will attend.

WHITEHEAD BROS. CO., Buffalo, N. Y.—The booth belonging to this company will be fitted up as a reception room. A few samples of molding sand will be shown. The following representatives are expected to attend: A. J. Miller, B. L. Whitehead Jr., J. H. Whitehead, R. L. Cleland, A. W. Jacus, A. Y. Gregory and R. L. Carpenter.

WHITING CORP., Harvey, Ill.—In this booth will be a sand cutting and screening machine, crane ladle with helical worm gearing, a set of helical worm gearing with a section cut away, tumbling barrel parts, vertical air hoist, model of crane trolley and photographs and drawings of equipment. The Grindle Fuel Equipment Co., a subsidiary of the former company, will exhibit in this same booth. J. H. Whiting, T. S. Hammond, R. H. Bourne, R. E. Prussing, J. S. Townsend, G. P. Fisher, A. W. Gregg, C. H. Erickson, W. A. Goebel and A. J. Grindle will be present.

E. J. WOODISON CO., Detroit.—Core and molding machines, foundry supplies, platers and polisher supplies will be included in this display. Representatives will be E. J. Woodison, C. H. Woodison, J. C. Woodison, G. A. Burman, A. W. Ferguson, A. F. Jordan, H. Z. Dingee, R. S. Hoffman, M. A. Bell, J. M. Whitters, William Wark, E. A. Mead, J. A. Carpenter, F. F. Shortsleeves, C. D. Pinkerton, R. Higgins, George H. Quinn, William Muir, W. W. Wright, R. A. Burritt, George H. Donaghue, H. T. Taylor, W. W. Bowring, E. C. Schafer and W. M. Maybank.

T. B. WOOD'S SONS CO., Chambersburg, Pa.—Taper snap molding, comprising the taper snap flask and automatic adjustable patented snap jacket will be included in this display. Charles M. Wood and Victor Leisher will represent the company.

YOUNG BROTHERS CO., Detroit—This company will show core ovens.

Uruguay Installs First Steel Foundry

On October 20 1921 the first steel foundry in Uruguay was inaugurated as an annex to the machine and structural shops of Silvia y Cia., Montevideo, which were established in 1904. A 1-ton bessemer converter is employed and although the capacity is limited it is felt that it will exercise a considerable influence on the industrial development of the country. Deposits of a grade of sand suitable for steel molding are available on the nearby beach. The installation of the most modern equipment manufactured in the United States would seem to assure the success of the project. Recently a number of comparatively large castings have been made for repairing government machinery engaged in experimental drilling for oil and minerals. According to the engineer in charge the castings were highly satisfactory.

Book Review

Electric Arc Welding, by E. Wanamaker and H. R. Pennington; cloth; 254 pages, 6 x 8¾ inches; published by Simmons-Boardman Publishing Co. and for sale by THE FOUNDRY, Cleveland; price, $4.

By virtue of their experience in handling electric arc welding problems in railroad work, the authors of *Electric Arc Welding*, who are electrical engineer and supervisor of electrical equipment and welding, respectively, of the Chicago, Rock Island & Pacific railroad, have been able to present a fund of practical information in a manner most easily understood by the user of electric welding apparatus. It is not claimed that the book covers the entire field of electric welding; it is confined almost exclusively to autogenous electric arc welding.

The text is divided into eleven sections and is supplemented by 167 illustrations, including reproductions of photographs, drawings and charts. Following a history of the evolution of welding embracing the five different methods, the equipment for the electric arc process is described and the operating characteristics and circuits explained. The subject of metal transfer also is discussed. In the section on training operators, the authors distinguished between universal and specialized welders. The former are those who are qualified to handle almost any type of arc welding. Highly skilled men are required for work of this kind. Specialized operators are classified in several groups such as pressure vessel, machinery, and structural welders and those working on repeat operations. In one complete section carbon arc welding and cutting, and in the following chapter materials for electrodes used in metallic arc welding are described and discussed. Methods of preparing work for welding are presented while special considerations involved in the welding of iron, steel and nonferrous metals are outlined. The portion devoted to arc welding in railroads and structural shops is an especially valuable contribution to the literature on welding because of the intimate knowledge of the authors on this particular subject.

Moves Its Sales Office

The Electric Furnace Co. has removed its sales and executive offices from Alliance to Salem, O. All of the departments of this company now are consolidated at the works, Wilson street and Pennsylvania R. R., Salem.

Will Sell Small Hoists

The Beckwith Machinery Co., Pittsburgh, has taken over the exclusive representation for the Shephard Electric Crane & Hoist Co.'s small hoist in the territory embraced by Ohio, east of Columbus, West Virginia and western Pennsylvania. The Beckwith company will maintain warehouse stocks at Pittsburgh, Cleveland and Charleston, W. Va.

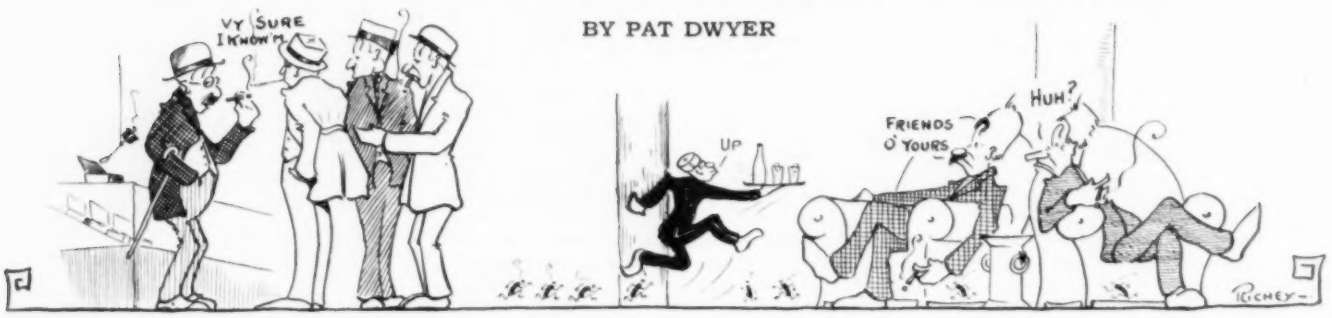
Rates Declared Too High

Freight rates on foundry flasks from Chicago Heights, Ill., to Oakland, Cal., were found unreasonable by the interstate commerce commission in the action of the American Manganese Steel Co. against the B. & O. railroad. Reparation was awarded. The period covered by the complaint was September, 1919.

The amount of wages lost in Pennsylvania in 1921 because of accidents was $9,924,959, while 2,061,733 days were lost by workers because of disability.

Bill Is All Set for the Rochester Show

BY PAT DWYER



SEATED in the lobby of a down town hotel one night recently, Bill and I found ourselves, without any conscious effort on our part listening in on a conversation between four apparently prosperous and, in their own opinion, important citizens. Some are born citizens, some acquire citizenship and others have citizenship thrust upon them. In the absence of proof to the contrary it is only reasonable to assume that these gentlemen had been born some place at one time in their career, but from the manner in which they manhandled their J's and W's it was quite evident that their birth certificates were not filed among the vital statistic records of the U. S. A. Early struggles with the intricacies of a language consisting mostly of long flocks of consonants had made them adepts in a supplementary sign language expressed through animated and eloquent gestures of the shoulders, eyes and hands. Force of habit, early association and environment is so strong that even now when toying carelessly with the unemotional English tongue they still throw in the gestures freely and apparently quite cheerfully.

To acquire citizenship in a new land one voluntarily renounces the land of his birth and swears allegiance to the land of his adoption. It is only natural to infer that a person takes this step because he thinks the new land superior to the old. These gentlemen furnished an interesting exception to this general theory. To them the country is no good, business is rotten. A band of grafters in Wall Street and Washington holds the nation in an iron grip and is slowly but surely squeezing the few remaining pale, pink drops from the heart of a weary and overtaxed business. The working classes, swollen with pride and piffle, clothed in purple and fine linen, refuse to give up their silk shirts and automobiles so that no longer is it possible to classify a man properly in the social order by his outward appearance. They insinuate themselves into Pullman cars, hotel lobbies and orchestra seats in the theaters and really things have come to such a pass that one has to be careful with whom he strikes up a casual conversation. At one time a white shirt and collar served to identify a fellow traveller as a salesman like ourselves or perhaps a superior being who lived on the returns from invested capital; but now for all outward indication to the contrary, he may be a plumber or a bricklayer.

Types of Citizens

Judging them solely by their accent, these men were not native born citizens. By the manner in which they handled the well known knocker's hammer, in fact two of them, one in each hand, I should say off hand that they had not voluntarily acquired citizenship in a country which did not measure up to their expectations and therefore we are reluctantly forced to the conclusion that they are in the third class, those who have had citizenship thrust upon them.

Well, says you and what about it? Steady all, me hearty. Hold her on her course until we pick up the range lights. Yo! ho! ho!—and a bottle of rum!

Having disposed of the major and outstanding legislative and economic questions of the day in a highly satisfactory manner and having whole heartedly and unanimously condemned the sins of omission and commission of our duly constituted rulers, they resolved themselves into a mutual admiration and autobiographical association. Each one claimed N'York as his home town and each one deplored bitterly the necessity under which he was forced to spend a portion of each year in making what he chose to term the little burgs and hick towns west of Manhattan island. I gathered in a general way that each man represented what was beyond doubt the largest institution of its kind in the world and also without exception, each gentleman modestly claimed that he was the main spring, the moving spirit, the inspiration, which not only had placed the institution in its present premier position, but which held it there. The fact that no three of these merchant princes ever had heard of the fourth member previous to these disclosures, might have led me to question the authenticity of some of the statements, but I reflected that New York is quite a large town where no one knows his neighbor.

A chance remark touching on things theatrical livened the conversation wonderfully. Instead of carrying on as usual, one at a time, they threw all rules and regulations in the discard and made it a unanimous and enthusiastic foursome in which all four participants insisted on hitting the ball at the same time. Out of the melee of flying arms, and crippled words and phrases I gathered in a general way that each man was an enthusiastic follower and supporter of the drama as it is exemplified on the screen and stage. They were acquainted personally with the principal producers and at one time or another had met every one who is who, on the theatrical circuit. O'cassionally one of the quartet was temporarily embarrased by his inability to remember the name of a celebrity. He distinctly stipulated that the name was on the "tip of his tongue," by which he probably meant the tip of his fingers. I simply advance this theory based on the fact that he al-

A LITTLE LEARNING—OH! WELL, SAY IT YOURSELF

ternately snapped the fingers on either hand several times in an effort to recall the name. However, invariably one of his colleagues came to the rescue by suggesting a name and it speaks highly for their individual and collective knowledge when it is stated that the others immediately concurred.

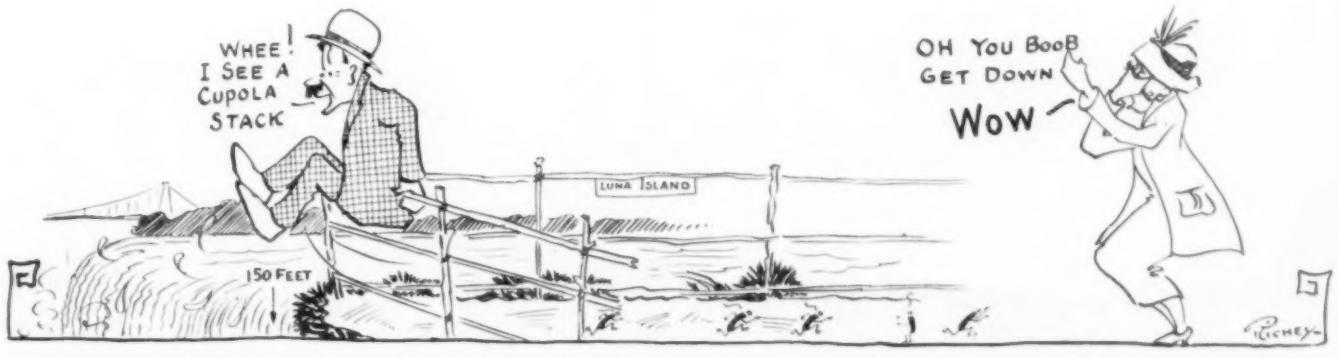
I was deeply chagrined to find that by a majority of four to one, I was wrong in my conception of some famous names. For instance, I always had been under the impression that Neil O'Brien was the name of the man who managed the minstrel troupe, but now for the first time, on the word of these experts, I learned that his name was, or is, Eugene. A second gentleman was reminded of a show he recently had seen headed by—this here fellow—what's his name, who sings for the Victorola records. He called on high heaven to witness that the name was as familiar to him as his own and joyfully acquiesced when one of the others suggested Billy Murphy. The fourth member of the group added the finishing touch. The last time he had been IN TOWN he had sat well down in front in one of his favorite theaters and had seen this here woman,you know, who wrote Humoresque. She had appeared personally, in person, herself and had made a talk about something, he just forgot for the moment what it was all about; but, "believe me kid she was some talker, not much to look at but kinda interesting if you get what I mean. Le's see what is her name?" Business of intense concentration, punctuated by futile whole arm gestures and finger snapping, culminating in the brilliant suggestion from the man on his right that the lady's name was Vera Gordon. Instant and unanimous recognition of the name by the remaining members of the quartet, "Sure! Vera Gordon."

"Come on," said Bill. "Let's get out of here. First thing you know one of those birds will be announcing that Babe Ruth wrote the words and music for *The Bat* and that the *Four Horsemen of the Apocalypse* is a western drama featuring Bill Hart. Do you know I often wonder where the average man picks up all his misinformation and I wonder still more at the tenacious manner in which he clings to opinions without the slightest vestige of foundation in fact. You need not go outside the ranks of your own industry to find examples of this peculiar turn of mind. In this respect they resemble the meek, sedate and venerable old Quaker who is credited with telling his wife 'Every person is queer except thee and me and some times, dear heart, I have my doubts about thee.' The average man follows the line of least resistance. He does not take kindly to changes and innovations. In this connection, it is interesting to speculate what effect the granting of equal rights to women will have on the casting industry. Heaven knows they change their minds often enough which probably accounts for the alleged fact that their minds are so much cleaner than men's.

FAVORITE FOUNDRY SAYINGS "SHUT HER OFF!"

"The founding of metals is one of the oldest industries practiced by man. Agriculture, of course is the oldest. Whatever else a man does or does not, he must eat and owing to certain natural limitations, this food must be cultivated and prepared before it is fit for human consumption. This condition always has obtained with the single exception when for forty years the Chosen People had their post toasties served up fresh every morning without the necessity of a hand's turn on their part. This condition probably always will obtain and therefore the agricultural industry always will be the most important. The clothing industry had a modest beginning, or immodest, depending on the point of view and also to a certain extent on the physical standards, the tensile strength and the elastic limit of a fig leaf. This subject presents several interesting features including the opportunity for some of our clever, young arithmetical experts to figure how long it will take at the present rate of contraction before the ladies' skirts once more qualify under the standard established in the Garden of Eden.

"However, as I said before, the founding of metal is a fairly ancient art and although individual examples of extraordinary skill bob up here and there through the centuries, it is only during the past 100 years that the business has attained to a really important status. Lack of transportation facilities and ready means of communication held back the development not only of the iron, but of all other industries, and tended to localize and circumcribe any discovery or development. Even within the memory of men now living the greatest secrecy was observed and founders jealously guarded what they were pleased to consider their own exclusive process for producing castings. Gradually as they began creeping out of their shells they discovered that their wonderful secrets were not so mysterious as they had imagined and that other men had pursued similar investigation and had arrived at practically similar conclusions. One interchange led to another and with the launching of the American Foundrymen's association in 1898 a policy of laying all the cards on the table was inaugurated and that policy probably more than any other



NOW THE QUESTION NATURALLY ARISES: IS THIS ONE OF THE PLACES WHERE ANGELS FEAR TO TREAD?

is responsible for the truly remarkable growth and prestige of the foundry industry in the United States at the present time. No one man knows it all and no one man possibly can work out all the problems incident to foundry operation by himself. Meeting together on periodic occasions, exchanging views and experiences is bound to not only benefit each individual taking part, but also reacts on the industry as a whole."

"Shut off the wind for a minute Bill," I said. "She is coming down too fast. Let's get a fresh ladle under the spout. Leaving generalities to one side temporarily and coming right down to concrete cases, what do you think of the prospect for a well attended convention this year?"

"Excellent," said Bill. "Never better. From the interest displayed I believe there will be a larger attendance than at any former convention. Practically all the space in the exhibition building is engaged by the manufacturers of foundry equipment, supplies and accessories. These men from the very nature of their business constantly have one ear to the ground, anticipating the future trend of the industry and usually are one or two jumps ahead of present requirements. Did you ever stop to consider the important part the manufacturers of molding machines have played in promoting the casting industry and elevating it to the comparatively high plane it occupies today? They have made an intensive study of the subject, much more so in many cases than the men directly responsible for the actual production of castings. They have been on the job early and late, planning, scheming, developing ideas every day in the year, including Sundays and holidays. In the great majority of cases they are enthusiasts with the true creative spirit, more intent on demonstrating the practicability of their ideas than in the emolument involved. Their efforts have resulted in making from 2 to 20 castings grow where one grew before and they have persisted in the face of apathy, indifference and conservatism characteristic of the foundry industry. Frequently in later years and invariably in former years, the manufacturer of molding machines has discovered that the problem of convincing a foundryman that a given machine will increase his production and reduce his expenses, is of greater magnitude than that involved in designing, developing and constructing the machine in the first place.

"Conditions surrounding this convention and exhibition differ radically from those which obtained at a similar affair held at Columbus, O., in the fall of 1920. At that time the foundry industry was at its peak and in fact was beginning to show signs of starting on the down grade which it has pursued steadily almost up to the present time. Foundrymen, while interested, were not particularly keen on investing in new equipment or in the adoption of new and improved processes. They were beginning to throw an occasional eye to windward and considering the advisability of shortening sail. To pursue the nautical simile a little further they have been stripping the canvas off the old hooker ever since and for a considerable weary time have been drifting under bare poles—and on short rations. Recently an occasional catspaw has rippled the placid surface of the business ocean. Stray bits of evidence, some tangible and others intangible, but both significant to these skilled navigators, would seem to indicate that the long weary drifting is almost over and that soon, very soon, the crew once more will be tailing aft on the main braces; once more the straining rigging will hum like a giant harp and the whistling trades will drive the old boat over the harbor bar and into the home port on the crest of the rising tide. Hot Dog!"

Water, Water Everywhere

"It may be," I said, "that I am denser than the ordinary citizen, but I fail to see the necessity or appropriateness of dragging in nautical terms. The foundry business essentially is a landsman's occupation and I think you might have found a suitable comparison, if a comparison is necessary, without wandering like a lost soul over the dreary expanse of the seven seas."

"Say," said Bill, "If I were endowed with your peculiar gift, which thank heaven I am not, I should hire out as a professional mourner, or a deep sea diver. In the latter capacity you would not need to wear lead soles on your shoes. The form of simile I chose to employ does not make a particle of difference so long as you take my meaning and that is that business is on the up grade and you will find thousands of foundrymen at Rochester kicking up their heels, discreetly, or otherwise, depending on certain limiting factors or conditions over which they may have no control for the time being.

"However, just to show you that the watery similitude is not so far fetched as it might appear, I'll tell you in confidence that the Missus is going to favor me with her company this year. We are going down to Buffalo by boat; we are going to see the falls of the Genessee where Sam Patch jumped to his death, we expect to form a part of the august company spending a day cruising the lake in the S. S. CAYUGA, and she has made up our mind that we shall visit Niagara Falls on the way home. Water? Huh! You tell 'em, water the wild waves saying!"

Recommendations from German Committee

Reports on the work of what the Germans call their chief technical committee for foundry work were submitted at a meeting of the committee at Goslar, Harz, on Feb. 24 and have now been published. In connection with the testing of semisteel it was proposed that the expression *high grade cast iron* should be substituted. This was approved and will be discussed further by the standards committee. On behalf of the Association of German Iron Foundries reports were submitted on strength tests for cast iron, the welding of cast iron, the improper construction of steel and iron castings, contraction, cupola burdens, and the examination of cupola bricks. In connection with the experimental work on iron castings, Dr. Mardus made an appeal for a more plentiful supply of material relating to the subject by foundrymen.

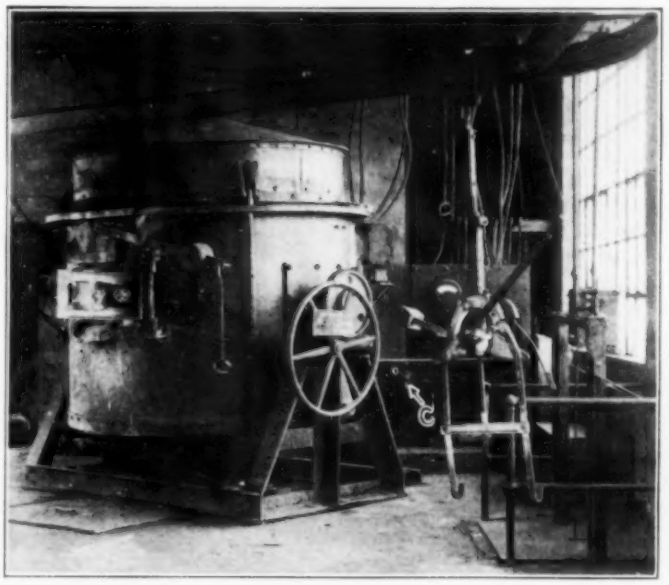
A report submitted by Dr. Behr on behalf of the Association of German Foundrymen dealt with investigations in regard to molding sand. A considerable amount of statistical material relating to sand obtained in various parts of Germany has been collected, and the results are expected to be valuable as regards saving in raw material and transport charges. Herr Treuheit dealt with the renovation of old sand, recommending an addition of clay.

The miscellaneous business included a report on the work of the standards committee, in connection with which a further meeting is to be held to compile a questionnaire to be sent to foundrymen for the purpose of obtaining suitable bases and materials for the standardization of foundry products. Another subject discussed was the general adoption of machine casting for foundry pig iron. The chairman asked the members to express an opinion whether sand cast pig iron was more desirable than machine cast. After a long discussion, although the view was expressed that in small foundries such a change would involve difficulties, the meeting decided that the proposal was practicable, but expressed the desire that certain conditions should be observed by the blast furnaces operating on foundry iron,

Valve Firm Operates Four Shops-II

Melting, Molding and Core Departments of the New Brass Shop on Second Floor—Electric Furnace Installed—Malleable Shop Being Modernized—Cupola Metal Used for Fittings

A TWO-STORY building was decided upon for the new brass foundry of the Kennedy Valve & Foundry Co., to facilitate handling operations. This building, of steel frame and concrete, has large areas of glass sash, and a monitor roof to carry away the smoke and fumes from the molds which are poured on the second floor. Fig. 1 gives a view of this floor and illustrates the large amount of sash used. The melting equipment of this foundry is somewhat different from that used in the old shop, the oil-burning furnaces being replaced by an electric furnace of the resistance type, built by the Electric Furnace Co., Alliance, O. This furnace is a large unit, having a capacity of 1500 pounds per heat, so five pit crucible furnaces for No. 70 crucibles have been installed. These are coke fired and have natural draft. The electric furnace is hand regulated. The handle of the controller may be noted at *C* Fig. 2. Each notch it is advanced adds to the power input of the furnace so that the temperature may be controlled by this means. Metal is brought to the furnace from the stock room on the floor below by the small 1-ton, air-operated elevator shown at the right, Fig 2. It is poured from the furnace into ladles operated by a special pouring device and carried on an I-beam trolley system to one of the four I-beam cranes which cover the molding floors. One of the pouring devices without a ladle is shown hanging to the overhead track in Fig 2. These are manufactured by the Arcade Mfg. Co., Freeport, Ill. The molding floors are served by a unique sand-handling system. In addition to two tub molders and one floor molder the other molders operate on eight machines, six of which are the pattern-draw, air-squeeze type manufactured by the Hanna Engineering Works, Chicago, and two are air-squeeze machines furnished by the Federal Malleable Co., West Allis, Wis. These machines are arranged around two sand conveyors in such a way that sand may be dropped on each machine from a chute over it. A general view of the foundry showing the arrangement of the machines is shown in Fig. 1. This illustration also shows the two oil-fired ladle heaters at the extreme right. The molder pours the metal, then wets the top of the molds and takes out the castings. A laborer takes the



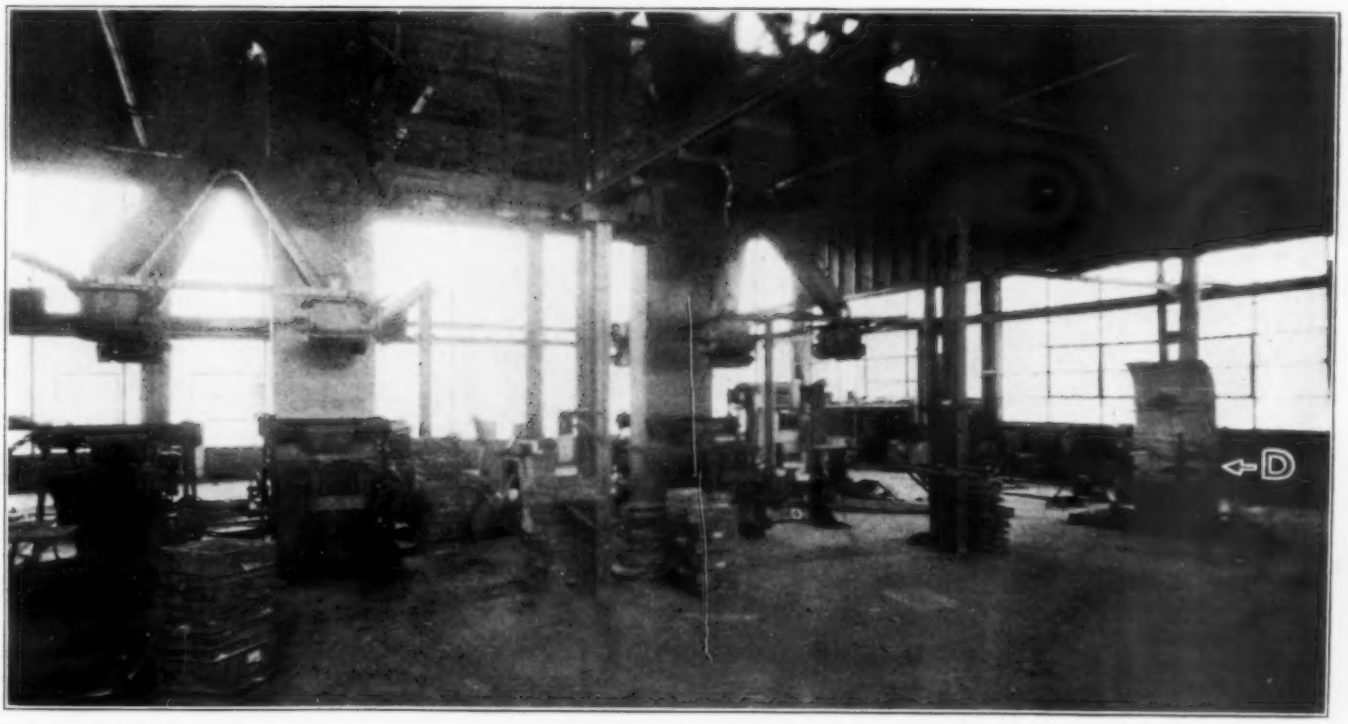


FIG. 1—EIGHT MOLDING MACHINES ARE ARRANGED AROUND TWO SAND CONVEYORS FIG. 2—ABOVE—METAL IS MELTED IN A RESISTANCE TYPE ELECTRIC FURNACE

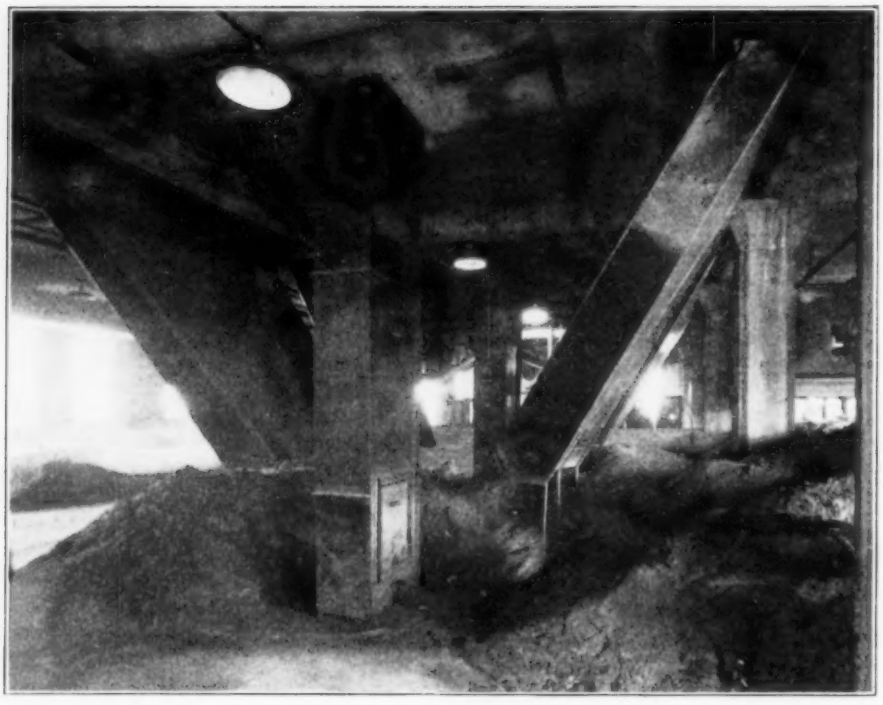


FIG. 3—SAND FROM THE MOLDS IS DUMPED THROUGH SCREENS TO THE FLOOR BELOW WHERE IT IS SHOVELED INTO CONVEYORS WHICH CARRY IT BACK TO THE MOLDERS

castings to a chute and drops them to the cleaning room. The molder then wets the sand on the floor after which it is dumped through a grating, falling between the two sand conveyors on the first floor. The arrangement of these chutes with the conveyors between them may be noted in Fig. 3. One laborer shoveling sand to the conveyors keeps the molders supplied.

When the castings drop through the chute to the first floor the sprues are cut off on a sprue cutter except that for larger castings, mostly manganese bronze, the sprues are sawed off. The sprues are thrown into a barrel and wheeled to the metal stock room where they are weighed into the charge before being returned to the furnace for remelting. The castings are cleaned in two sand-blast barrels made by the New Haven Sand Blast Co., New Haven, Conn.

An ingenious machine has been built by the Kennedy company for pickling the castings. The machine, shown in Fig. 4, has eight arms each of which hold one of the buckets, made of perforated sheet aluminum, used for dipping the castings. A motor operates this mechanism so that, controlled by cams, the arms are lowered sufficiently to submerge the buckets in the liquid contained in a tub or jar beneath each arm. The bucket is held in the liquid approximately 13 seconds and then is raised and after being allowed to drain for a few seconds is moved over the next tub by a partial rotation of the entire arm fixture, ready for another dip. In this way the castings are first submerged in water heated by a steam coil, then are carried successively to five other tubs containing pickling solutions, alkali or water, and are submerged in these for a fixed time.

No tubs are under the other two arms which are used to put on and take off the buckets. It is rarely if ever that all the arms are full of buckets, which are put on as they can be handled by the man operating the machine.

As in the old foundry, a water mill is used for recovering the metal from the furnace ashes and floor sweepings. So far the cores are made in the old foundry although a core room has been laid out on the second floor of the new building and shortly will be fully equipped. Then the sand will be mixed on the ground floor and taken to the core room in special carriers on an elevator.

The core room in the old foundry is also on the second floor, but in this case the sand is not only carried up to the core room but the cores which are handled on racks and trays must be taken in trays to the molder on the first floor of the old foundry and on the second floor of the new. As the cores made in the brass foundries are mostly small, drawer and shelf-type ovens are used. The two metal, shelf-type ovens were built by the Ohio Body & Blower Co., Cleveland, and the two drawer-type ovens were made by the Millet Core Oven Co., Springfield, Mass.

The buildings are heated by a system furnished by the American Blower Co., Detroit. This consists of a fan which blows air over steam pipes and distributes the heated air through pipes with suitable openings which extend through the foundries. The new foundry as described is a section only, the intention being to increase its size when more production is required.

Having had for a number of years both a brass and a gray-iron foundry the company still needed a malleable iron foundry to enable it to produce fittings which enter to a large extent into its product. Therefore, when opportunity to acquire the old malleable-iron foundry built by the American

FIG. 4—A SEMIAUTOMATIC DIPPING DEVICE IS USED FOR WASHING THE CASTINGS WHICH TRAVEL FROM ONE SOLUTION TO THE OTHER IN ALUMINUM BUCKETS

Bridge Co., presented itself, the company took it over and started to equip it with modern facilities for producing castings.

The main body of this L-shaped foundry is 70 x 270 feet, and a branch, which is used as an annealing room, is 60 x 250 feet. As in many other foundries making malleable-iron fittings, the metal is melted in cupolas. The iron is unloaded by the aid of a gravity conveyor made by the Matthews Gravity Carrier Co., Ellwood City, Pa. From the stock pile it is wheeled to the elevator which carries it to the cupola charging platform.

The two cupolas are lined to 36 and 46 inches respectively. The metal is of the usual composition for malleable-iron fittings. Being a new product for this company extreme care is exercised to secure good results. Among the precautions taken are the use of charcoal pig iron and a hydraulic test on the majority of the castings. The cupolas being located near the center of the molding section, iron may be carried readily in hand ladles from the mixing ladle in front of the cupola to the molds.

FIG. 6—CORES ARE BLOWN BY A MACHINE AND PUT ON A RACK

FIG. 5—MOLDS FOR ELBOWS ARE MADE ON AN AIR-SQUEEZE MACHINE

Fourteen plain air-squeezer machines, made by Henry E. Pridmore, Chicago, are used in the molding department. The patterns which are all of a shallow draw are mounted on plates to which vibrators furnished by the Malleable Iron Fittings Co., Branford, Conn., are attached.

Cores are made of lake sand with an admixture of 25 per cent of old sand bonded with an oil binder. The sand is mixed by an electrically operated riddle made by the Great Western Mfg. Co., Leavenworth, Kans. Many of the cores are made on a machine furnished by the E. J. Woodison Co., Detroit. This machine, Fig. 6, forms the cores by blowing sand into the box. Three men compose the force for operating the machine and blow 200 coreboxes an hour. One man puts the two halves of the box together and places the box within reach of the operator who blows the cores and passes the box to the third workman. This man removes the upper section of the corebox, and replaces it by a form which fits snugly over the core. The form and remaining part of the corebox are rolled over together and then the second half of the corebox, now uppermost, is removed. The form containing the core is placed in the oven and the assembled corebox is placed back on the core making machine. A second machine operated on the same general principle has been ordered from Wm. Demmler & Bros., Kewanee, Ill.

As may be noted in Fig. 6, the cores are handled on racks. These are put in two double-ended coke-fired ovens by hand-lift trucks. After coming from the oven, the cores are put on trays and sent to the molders. A tray of cores may be seen at the left, Fig. 5, which shows one of the molders at his

FIG. 7—ANNEALING POTS ARE HANDLED BY A HAND CHARGING MACHINE—PYROMETERS RECORD THE TEMPERATURE

FIG. 8—CASTINGS AFTER BEING PICKLED ARE GALVANIZED IN A BATH OF MOLTEN ZINC HEATED BY A COKE FIRE

bench. The cope flask set on its side illustrates the method of gating the patterns from a central riser. It also shows how cores made in sets of two or four are placed. These cores for elbows are made four in a box and some are broken in two at a notch between the prints. The arrangement of the cores for making four elbows is shown in the center of the flask while the arrangement of the double core is indicated at both the upper and lower edges. Snap flasks furnished by the Adams Co., Dubuque, Iowa, are used with bands at the parting line. Ts are molded similary to the elbows, three T cores being made in one unit.

Floors for Annealing Pots

While the bulk of the castings made are small, two floors with overhead trolleys have been equipped for molding annealing pots. These are of the rectangular form as shown to the right of Fig. 7, which gives a view of the annealing department with the three ovens. These ovens are coke-fired from firepots on both sides of each oven at the rear. This method of firing gives a comparatively even temperature through the oven, the greatest variation between different parts of the oven being about 50 degrees Fahr., after the oven is up to temperature.

A close check is kept on the temperature all through the cycle by pyrometers furnished by the Wilson-Maeulen Co., New York. Two thermocouples, attached to a recording instrument kept in the superintendent's office, are maintained in the oven through the anneal, both extending through the door, the one near the top and the other near the bottom as indicated at *E, E*, Fig. 7. Other couples put in the ovens at different points register the temperature on an indicating instrument connected to them by a 10-point selective switch. The temperature is increased gradually until the highest thermocouple registers 1650 degrees Fahr. This temperature is held for 72 hours after which the oven is slowly cooled, the doors being opened after all color has disappeared from the pots.

For charging and unloading the furnace a hand charging machine shown at the right, Fig. 7, is used. Four men operate this machine, each one holding by a handle, two of which are shown near the end of the machine. The bar at the extreme end is connected with the prongs on which the pots are raised by such a large leverage ratio that one man can readily handle the pots raising a load of as much as 5 tons. The rear wheel is on a pivot, thus enabling the machine to be directed in any course.

The cleaning room, situated in the angle between the molding department and the annealing section is equipped with six 30-inch tumbling barrels and eight grinders. Two of the barrels are used for hard-iron castings and two for the annealed castings. The grinders are equipped with dust guards.

The galvanizing department is shown in Fig. 8.

Considers Melting Nonferrous Alloys

Methods of melting nonferrous alloys were discussed at a recent meeting of the Wolverhampton branch of the Birmingham (England) Metallurgical society by A. J. G. Smout, chief chemist, Elliotts Metal Co., Ltd., Birmingham. Having outlined the ideal method of melting and the more important factors to be considered, the speaker explained that unfortunately no one method of melting or type of furnace combines all the best features. He also explained that it is not always a simple matter to determine which to employ, as local conditions enter so strongly into the problem. Notwithstanding the obvious disadvantages of the ordinary coke-fired pit furnaces for crucible melting, they were still, he said, the most generally used, and there are sound theoretical and economic reasons why this should be the case. Among the improvements which have increased the thermal efficiency of the coke-fired furnace are the drop-bottom arrangements to secure a better draught and more efficient application, distribution and conservation of the heat, and the introduction of a proper preheating chamber. Preference was expressed for a round rather than a square furnace, one reason being that it allows more fuel space. The largest pit-type coke-fired furnace that can be worked economically was said to be one for a No. 200 crucible. No economy, the author continued, can be effected by the use of an inferior grade of fuel. In considering relative efficiencies of various fuels for melting purposes it was pointed out that it is not fair to compare a coke-fired furnace of an old type with a gas or oil-fired furnace.

Gas Producers Near Furnaces

Mr. Smout expressed a doubt as to whether it is economical to convert coal into gas in large central stations and subsequently burn the gas in melting furnaces, the loss in efficiency by this method being considerable. A more economical method of utilizing coal was said to be by means of a self-contained producer built into each group of furnaces. This increases the thermal efficiency 25 per cent over the central station system. Figures were shown which were secured by R. J. Redding, as the result of his experience at the government munition factory at Southampton during the war. In these experiments water gas first was generated at a central station one-third of a mile from the furnaces. This did not produce a high enough temperature and gave a low efficiency. When furnaces with producers attached were installed the improvement was fully 25 per cent.

The various methods of using oil as fuel for metal melting were described but doubt was expressed as to whether at the present time there is a readily available source of liquid fuel suitable for melting metal, which is sold at a price to compete with coke. In the face of today's exorbitant prices for current from British power sta-

tions it was said there seems little prospect of electricity, which is the ideal fuel for metal melting, becoming at present a practical proposition in England for brass melting, although manufacturers are beginning to experiment in this direction.

In conclusion, reference was made to Mr. Harvey's report on pulverized coal systems operated in America and consideration was given to the possibilities of this new fuel for brass melting.

How and Why in Brass Founding

By Charles Vickers

Tough Aluminum Alloys

We would like to obtain a formula for a tough aluminum alloy as we have some strips to cast therefrom. We have tried a number of formulas without getting a metal sufficiently tough for the purpose. In some scrap aluminum, composed of automobile parts we found some small web gears about ⅛-inch in thickness at the web, which we found almost impossible to break and we would like to know the mixture.

The most satisfactory way for discovering the mixture of any metal that pleases the fancy is to have an analysis made and file the results for future reference. In the case of these web gears it was the obvious thing to do. The difficulty with many brass foundrymen is that they appear to be afraid of the chemist and his analyses, and miss many opportunities of improving their practice by this attitude. We make the suggestion to all brass founders, when at any time a metal is found in the scrap pile that appears in any way different to ordinary alloys, that the piece be removed and sampled and at least two analyses be made by different laboratories. The cost of this work is trivial compared to the possible gains, as it can never be foretold when information thus obtained will become useful.

In the present instance the alloy was that known as magnalium. It consisted of aluminum (commercially pure) 93 per cent, and magnesium 7 per cent, provided the gear was a casting. If it was a forging it would be a copper-manganese-aluminum alloy, probably McKinney's alloy of copper, 2 per cent; manganese, 1 per cent and the remainder aluminum.

Making Molds For Lead

We have an order for some cast lead pipe, and would like to be informed as to the process of making the cores and anchoring the same.

The cores for castings of lead can be made in the same manner as for iron castings but, owing to the fluidity of the metal, they should be given a good smooth coating of blacking to prevent the lead sinking into the cores. The molds will have to be rammed well and be coated and polished with plumbago. Also, owing to the high specific gravity of the lead, the molds must be securely held together. If there is the least danger of runouts, attention must be given to the weak point, so as to make this impossible, as the chances of stopping a runout of lead are extremely small. *Rub-in* the joint with a mixture of molding sand and plaster of paris mixed to a mud, and use the same wherever necessary to stop the lead running.

Zinc Must Be Kept Out of Babbitt Metal

We find it necessary to make our own babbitts, but do not know exactly the method of procedure. The alloy we wish to make has the following composition: Hardener, 12½ pounds; antimony, 10 pounds; tin, 15 pounds; phosphor tin, 5 pounds; zinc 5 pounds; lead, 200 pounds. The hardener consists of an alloy of 50 per cent copper and 50 per cent tin. We melt with gas and we suppose the hardener will have to be melted in the brass furnace. Any suggestions will be gratefully received.

The brass furnace will assist materially in making the hardener because the copper first can be melted under a covering of charcoal, then the other ingredients added to make an addition alloy that will melt in the iron kettle, if necessary. The first thing to do to study the mixture is to calculate it into percentages as follows: Lead, 80.80 per cent; copper, 2.52 per cent; tin, 8.58 per cent; phosphor tin, 2.02 per cent; zinc, 2.02 per cent; antimony, 4.04 per cent; total 100 per cent.

The mixture now stands ready for critisism. It contains two metals having no business at all in the mixture. These are phosphor tin and zinc, and while a little copper is sometimes used in such alloys it generally is better dispensed with also, as it produces sluggish metal. This latter is fatal to a cheap babbitt, and is a bad fault of an expensive babbitt.

We suggest this formula be discarded However, if not entirely satisfied with this suggestion, make up a few pounds according to the formula you have given and test it out, and all doubts will be removed. Throw away the metal that is left over for it may get into the brass mixtures and ruin them.

In making babbitts—both tin-base babbitts and lead-base babbitts— zinc must be kept out of the alloy because it will produce dross, and also rob the babbitt of its natural fluidity. Phosphorus if used at all must be used in homeopathic doses; a little goes a long, long way, and 2 per cent of a 5-per cent phosphor tin is far too much to use. Two ounces to the hundred pounds would be better, and 2 ounces of a 5 per cent sodium tin would be preferable.

The following mixture is cheaper than the one you suggest, and will give better service; also it is quite easy to make:

Antifriction Metal

	Pounds
Lead	80
Antimony	15
Tin	5
Phosphor tin	none
Zinc	none
Copper	none

Simply melt about half the content of lead; get it red hot, then add the antimony in small pieces as it will dissolve; stir well, add the balance of the lead, and lastly the tin. The result will be a good standard cheap *babbitt*.

Brass For Thin Castings

We would like to learn what alloy of brass will run the thinnest castings, and have the greatest amount of strength.

Use manganese bronze for this purpose. This metal will run just as thin castings as any other alloy and have greater strength. Aluminum bronze, containing 3.5 per cent iron; 7.5 per cent aluminum, and the remainder copper also will run thin castings and possess great strength.

The red brass alloys all are about the same, and in thin castings will be far inferior to manganese bronze or aluminum bronze in strength. They are less fluid and to secure thin castings without defects frequently requires a knowledge of a trick of pouring the metal, only gained by experience. Manganese bronze may be purchased in ingot form and is quite suitable for remelting to make such castings as you desire.

Melts Gray Iron Electrically

Cheap Current Makes It Profitable To Melt Both Iron and Steel for Castings Electrically—Power Consumption Figures Given—Iron Produced Has Uniformly Fine Grain

BY W. E. CAHILL

ELECTRIC furnace iron castings have been made by the Alaska Treadwell Gold Mining Co., since October, 1918. The factors that entered into the adoption of the electric furnace were many, and the results attained such as to warrant the discontinuing of cupola melting.

For a period of about seven months in the year the Treadwell company has a surplus of electric power generated by their hydro-electric plants. During shortage power may be obtained from another local company at a low rate. Hence the factor of power supply which is most important presents no difficulty.

The company is charged nominally at the rate of one cent per kilowatt hour. Connellsville coke costing $8 per ton on the Atlantic coast costs $48 per ton delivered to the foundry. Foundry pig iron costs from $45 to $50 delivered. The conditions above mentioned make it possible to produce electric-furnace iron castings cheaper than can be done with the cupola, not to mention the great difference in quality.

It was soon found that pig iron was unnecessary. An all-scrap charge of machinery scrap melted and refined on a basic hearth resulted in a superior quality of metal. The melting is done in an 800 kilowatt, 3-phase, 2-ton Heroult furnace in a neutral or reducing atmosphere under a reducing slag. Refining takes place during the whole period of melting, and by the time the bath has been raised to the required pouring temperature the sulphur has been removed below all practical limits, and the metal is ready for the molds.

For medium weight castings no additions are made; for small castings and thin sections the silicon can be increased as desired by addition of the ferroalloy. The analyses in Table I are mostly from all-scrap cupola-melted iron that has been through the electric furnace.

From this table of analyses it is plainly evident that one of the problems of the iron foundry, *i. e.*, the high percentage of sulphur in commercial scrap, can be easily eliminated through the medium of the electric furnace. Phosphorus can be controlled by the use of steel scrap, silicon and manganese by the addition of the ferroalloys to the bath.

For economic melting of cold scrap iron in the electric furnace the nature of the charge is important. The charge must not be too dense, otherwise the electrodes will not penetrate the charge, but do most of the melting from the top. This will cause early heating of the upper part of the furnace with subsequent losses by radiation. The melt will be dead, and will require considerable unpleasant manual labor of poking to free the bottom of metal. Sprues and gates make the best charge for the bottom, clean scrap for the top is desirable for electrical conditions. Low current is used in starting until a good circuit is established. If insulation develops, the best remedy is to shovel crushed electrodes, about walnut size, around the electrode that is giving trouble. This electrode material will afterwards unite with the lime to form a carbide slag. As soon as full current is on the lime is shoveled in. The lime requirements are about 2 per cent of the charge, with sufficient fluorspar or silica sand added to make it active. Coke is added with the lime. The resultant slag is strongly carbide and will analyze up to nearly 1 per cent sulphur. If the slag is kept right, little hearth repair is necessary, usually 10 to 20 pounds of magnesite will suffice. The danger of burning the bottom is slight, as cast iron melts at a much lower temperature than steel.

The temperature of the metal is under control of the operator. Electric furnace iron is necessarily poured hotter than cupola iron, due to the absence of fluid forming impurities. By running hot iron it is possible to reduce the size of gates and risers.

Foundry procedure when using an electric furnace is different from the cupola. The time-honored custom of molding until the cupola blast is on is discontinued. Iron from the electric furnace may be tapped in any amount from a few pounds to the whole charge, and at any interval, the remainder in the furnace being held at the required temperature until called for and raised or lowered as desired. The floor can be cleaned almost immediately after pouring, as low-sulphur iron is noticeably not so tender, and may be pulled out while still hot without injury.

The most distinguishing characteristic of electric-furnace gray iron is its uniformly fine grain. It is claimed by some to be due to low phosphorus, which prevents grain growth. As the same texture is found when the phosphorus is fairly high, low sulphur must have some influence, but probably the greatest factor is the thoroughly deoxidized condition of the metal and the absence of occluded gases.

Power consumption varies greatly with

Paper presented at the convention of the American Electrochemical society, held in Baltimore, April 27 to 29.

Table I

Irons Treated in Electric Furnace

Heat No.	Silicon	Manganese	Sulphur	Phosphorus	Carbon	Graphitic
14A	2.15	0.44	0.030	0.334	2.96	...
149	2.02	0.47	0.056	0.49	2.90	...
13B	1.83	0.57	0.020	0.41	2.95	...
70	2.19	0.64	0.048	0.44	2.96	...
121	1.93	1.28	0.054	0.50	3.01[1]	...
144	1.88	0.61	0.064	0.37	3.17	...
151	2.19	0.67	0.044	0.45	3.23	...
154	1.64	0.63	0.031	0.40	3.23	...
163	0.69	0.54	0.071	0.23	2.50[2]	...
166A	0.69	0.49	0.086	0.190	2.43[2]	...
166B	1.78	0.55	0.032	0.195	2.42[3]	...
172	0.65	0.62	0.049	0.29	2.50[4]	...
178	2.18	0.58	0.031	0.36	2.55	2.54
181	2.00	0.54	0.027	0.38	2.80	2.81
184	1.56	0.58	0.023	0.195	3.27	...
1C	1.79	0.56	0.049	0.52	2.81	2.62
48	1.56	0.47	0.069	0.33	2.72	2.71
61	1.77	0.55	0.054	0.40	2.77	2.50
77	1.73	0.57	0.063	0.53	2.58	2.57
92	1.74	0.45	0.055	0.53	3.16	2.78

[1] After first tap 160 pounds manganese steel was added.

[2] Hard iron.

[3] Before last tap of 166A 12 pounds ferrosilicon was added to pour a rush order of castings. These castings machined nicely.

[4] Add to analysis—Carbon 0.61 per cent. Chrome ore was used in charge with gray iron to make hard iron.

both iron and steel, depending upon whether or not the charge is melted in a cold furnace or immediately after a previous heat. During the spring of 1920 the transformer was wired to give two-voltage control with a range of from 100 to 120 volts. While the range is not great, the results are interesting as shown here:

	Iron Kw. H per ton	Steel Kw. H per ton
Single voltage	784	893
Dual voltage	709	851

The averages were taken for 25 consecutive heats each of iron and steel after new lining. With steel the higher voltage was used for melting and the lower for refining; with iron the change was made to lower voltage when the scrap was nearly all charged. If the higher voltage is left on after the scrap is all charged the furnace heats up too much. The foregoing figures are for intermittent operation and may seem high but melting cold scrap in a cold furnace is necessarily high, as considerable energy is absorbed in heating the furnace.

Intermittent operation of the electric furnace shows its most severe effect on electrodes and roof. During the period of idleness the electrodes are above the oxidizing temperature for several hours, which causes the electrodes to pencil. The reduced area increases electrical resistance. The reduction continues until it cuts through to the thread and the stub (about 14 inches average) drops off. In three years of operation the company has only broken two carbon electrodes, and these broke in the threads soon after the joint was made.

When alternating heats of iron and steel great care must be taken in furnace operation. Of prime importance is a good spout so that the furnace will completely drain. The effect of residue iron on steel is marked. The slag must be fluid enough to run out with the iron, otherwise it will mean additional sulphur to be removed from the next heat of steel. If a heat of steel is to be made after iron, the furnace should be charged with low-carbon steel scrap so the melt will be fairly low. The carbon may be lowered by adding iron ore, but there is a limit to this reaction. If carried too far it will begin to show its effect on the furnace. The removal of sulphur is not dependent upon carbon in the steel, but upon the length of time the steel is held under a carbide slag. If the sulphur is high the heat necessarily will be prolonged, which is objectionable for furnace reasons.

The analyses for steel made directly after a heat of iron are shown in Table II. After the first heat of steel there is no noticeable effect of iron, and the procedure may continue as in ordinary practice.

Table II

Tests from Heats of Steel after Iron

First Heat				
Silicon	0.15	0.34	0.39	0.24
Carbon	0.41	0.50	0.31	0.37
Sulphur	0.052	0.048	0.049	0.068
Phosphorus	0.065	0.040	0.048	0.047
Manganese	0.68	0.87	0.57	0.58
Second Heat				
Silicon	0.27	0.32	0.34	0.31
Carbon	0.40	0.47	0.34	0.42
Sulphur	0.021	0.026	0.030	0.040
Phosphorus	0.038	0.041	0.041	0.018
Manganese	0.73	0.68	0.78	0.79

Looks Back on Fifty Years of Progress

BY R. H. PALMER

FIFTY years ago on March 4, 1872 I became apprenticed to learn the molder's trade at the Rhode Island Locomotive Works at Providence, and it is interesting to look back on the foundry methods of those days and to see the progress of the industry as well as the individual steps taken by myself. I worked as a molder until 1883 when I became a foundry foreman, and have had charge of foundries in seven states and in Canada as foreman, superintendent and foundry manager, which latter position I now hold, having occupied it for the past six years with the Automatic Machine Co., Bridgeport, Conn.

Being of an inquisitive mind, I was never ashamed to ask questions seeking the why and wherefore and studying cause and effect. In the early days the foundries in general were poorly lighted with gas or oil. They were equipped for hand molding and the floors on heavy work were covered with jib cranes. Many of the larger ladles were arranged to be handled in pouring by being tipped with levers and I have seen twelve men on the levers to one handle.

For the light and medium castings the molders carried their own iron from the cupola, either with the assistance of a helper or of working partners. Also in other ways the work performed by the molder in those days called for more brawn and muscle than generally in required at present, as the handling appliances were few.

The styles of cupola varied in different locations. Many were constructed with high brick stacks, the crucible section being reinforced with cast-iron rings. The claim was generally accepted that the higher the stack and the less pressure of wind to more nearly approach a natural draught, the better would be the quality of iron which would approach that made in the air furnace. In many sections the McKenzie cupola was the favorite, either the round or eliptical form, burning sugar loaf Lehigh anthracite coal. The air was supplied by fan, the pressure blower, as I remember, coming in some years later. Melting iron with anthracite coal was often slow and uneven and a low melting ratio was secured. As the introduction of coke became more general, the fuel was used as an adjunct to the coal and slagging was resorted to more frequently. As coke became better understood by foundrymen its use for melting grew more extended until it occupied the field entirely. I have used in the cupola coal, coke and what was called *gashouse coke*. The latter being soft and requiring less wind pressure, did not carry the iron well and was higher in sulphur. However, today the by-product coke is equal to any other grade of coke for cupola melting.

The pig irons largely used were known as *coldshort*, *redshort* and *neutral*. Mixtures of these irons with scrap were regulated to give the desired quality of metal in the casting. Scotch pig was held in high regard. The iron for the larger and stronger castings was melted in air furnaces. Mixtures of steel with iron in the cupola were used but little and a great deal of discussion arose when the practice of

adding steel to iron mixtures became more general.

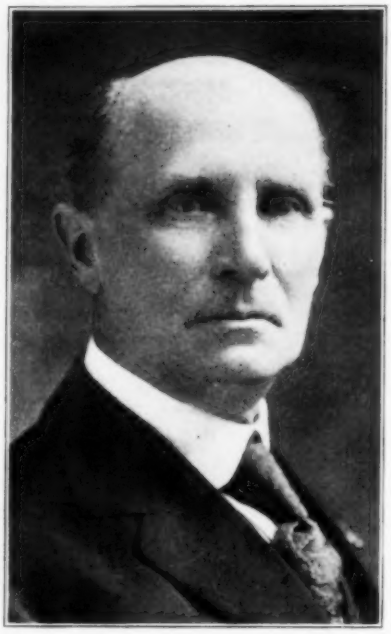
Almost universally small and medium-size castings were molded in green sand and either pickled or rattled. Large castings were made in dry sand or loam, especially the more intreiate ones. The use of seacoal facing was not general. Molds were blackened with ground plumbago, German lead, Lehigh coal, Rhode Island facing and charcoal. Rye meal and flour were the principal core binders employed. Oil was not used generally and pitch binders were known, if at all, only in restricted quarters. Mixtures of iron and of blacking for molds and cores were shop secrets.

A day's molding time was 8 hours and 2 hours more were spent in pouring off and shaking out the lighter castings. In many foundries the molder was called upon to cut his sand over once before leaving. He had to stay and see copes hoisted and castings treated as required after pouring. I have stayed in getting out special work, as late as 9 o'clock in the evening. As many foundries were operated on a price-work basis, we boys used to earn extra money by cutting sand at $1 per week.

Molding machines for the ligher work usually were of the squeezer-type. The foundry buildings for the lighter castings were generally of light construction and poorly ventilated. Sanitary conditions were not always good and as long as the sand did not freeze to the patterns, the foundry was considered to be warm enough.

Looking back it is a pleasure to recall some improvements in the foundry industry. Among these is the telephone connecting the various departments of the foundry with each other, and with outside establishments with which business relations are maintained. Electricity used for light and power, making possible the traveling crane, is another factor improving foundry conditions. Cupola practice has been bettered through the use of coke, giving higher melting ratios and quicker melting. Buying and mixing iron from chemical analysis, and subjecting it frequently to transverse strength tests as well as shrinkage tests and sometimes to tensile strength tests, has supplanted the old method of mixing by fracture.

The introduction of many appliances for using compressed air in the foundry, in molding and core machines, and the cleaning room, especially the sand blast and air hammers, has lightened the work in the foundry, and modern molding machines have greatly increased the output per molder. So the old foundryman might go on noting many improvements increasing output, reducing labor costs and bettering the conditions of the employes.



YOUNGER foundrymen do not realize the difficulties which confronted the molders of fifty years ago nor do they appreciate the progress made in the industry since then. For this reason R. H. Palmer who has just passed his fiftieth year in actual service in the foundry was asked to furnish a retrospective article giving the high lights in progress of the industry. Being both a worker and a keen observer Mr. Palmer frequently has written descriptions of foundry operations and is well qualified to give such a review of progress in the industry.

In those days technical books and papers on foundry practice were not available to any great extent. Today the foundry employe can find a great store of information in technical papers and books if he is inclined to seek a broader knowledge of foundry practice.

Sometime about 1867 or 1868 a number of foundry foremen, superintendents and owners met at Springfield, Mass., to form an association. These men recognized the fact that there was a call for improvements in foundry practice and that the old rule of thumb method must give place to scientific methods. They desired to associate together so that through a mutal exchange of ideas and experience they could benefit the industry in general as well as all those connected with it. These men were looking *forward.*

Prepares Standards for Testing Coke

The American Society for Testing Materials has submitted its standard methods of laboratory sampling and analysis of coke to the American Engineering Standards committee for approval as tentative American standard.

These methods were formulated by committee D-6 of the A. S. T. M. in co-operation with the American Chemical society, the American Foundrymen's association and the U. S. bureau of mines. The specifications are such that methods of coke analysis conform, in as far as practicable, with method of coal analysis, making due allowance for the differences to procedure that are desirable in the analysis for coke.

The American Engineering Standards committee desires to learn, from those interested, of the extent to which they make use of these specifications, and to receive any other information regarding the specifications in meeting the needs of the industry.

Production of Domestic Graphite Declines

Sales of domestic crystalline graphite declined 88 per cent in 1921 and sales of amorphous graphite decreased 61 per cent as compared with the records for 1920. Statistics covering the sales both of amorphous and crystalline domestic graphite for the five years 1917-1921 are shown in the following table.

DOMESTIC NATURAL GRAPHITE SOLD, 1917-1921

Year	Amorphous quantity (short tons)	Crystalline quantity (short tons)	Total quantity (short tons)
1917.....	8,301	5,292	13,593
1918.....	6,560	6,431	12,991
1919.....	3,379	4,043	7,422
1920.....	4,694	4,816	9,510
1921.....	1,842	595	2,437

Carburize Synthetic Cast Iron

(*Concluded from Page 393*)

ration of the iron had not taken place when the sample was taken.

There is practically no difference between the carbon content of the chilled samples and that of the slowly cooled pig samples in the results for the 0.2 and 2.0 per cent silicon runs, but there is a difference of 0.46 per cent in the case of the 7 per cent silicon run. These observations show that although the presence of a large quantity of silicon does decrease the amount of carbon in the pig, it does not affect the amount of carbon that it absorbed by molten iron.

Manganese—Curves *A* and *C*, Fig. 6

show the rates of carburization for high manganese and low manganese irons, respectively. By low manganese is meant 0.40 per cent and by high manganese, 1.75 per cent. Curve *A* has a steeper slope than curve *B*, indicating that manganese is beneficial. These curves are plotted from results obtained in the small furnace but not indicated in this discussion. Although the results show a distinct effect, it may not be large enough to warrant the statement that manganese is beneficial. However, it is to be expected that manganese aids the carburization of iron.

Sulphur—This element has always appeared to retard the rate of carburization and decrease the total absorption of carbon. Curve *E*, Fig. 6, and the curves in Fig. 8 are plotted from results obtained in a test in the large furnace, in which 0.8 per cent sulphur was introduced during the melting period. Fig. 8 shows that the absorption of carbon had practically ceased when the first desulphurizing slag was added, after which it increased regularly as desulphurization continued.

The effect of sulphur on the rate of carburization is shown in Fig. 6. From an examination of the results obtained in several other tests, not described here, the deleterious effect of sulphur is evidenced when the sulphur content is as low as 0.1 to 0.2 per cent, although the effect is not so marked as in the example discussed above.

It is surprising that sulphur should have such a marked effect, and it is not improbable that further work may show that something other than sulphur is responsible. However, the results of the present study show plainly that in the tests here described sulphur retards the carburization of molten iron.

Phosphorus—The study of the effect of phosphorus shows that it probably does not influence carburization. Curve *D*, Fig 6, showing the results of a heat containing 0.75 per cent phosphorus has an average slope of approximately the same degree as have the curves for the phosphorus-free runs. The slow rate of carburization at the beginning of this test was undoubtedly due to the presence of some slag, because when this slag was removed absorption of carbon took place rapidly. In other tests performed in the small furnace, phosphorus showed practically no effect upon the carburization rate.

Appoint Sales Agent

The Power Plant Equipment Co., Coca-Cola building, Kansas City, Mo., representing the Combustion Engineering Corp., New York, has been appointed western sales agent in a territory including parts of Kansas, Nebraska, Arkansas and Missouri.

The Debevoise-Anderson Co. has moved its offices to larger quarters at 114 Liberty street, New York.

Checkered Floor Plate Made by Hand

BY M. E. DUGGAN

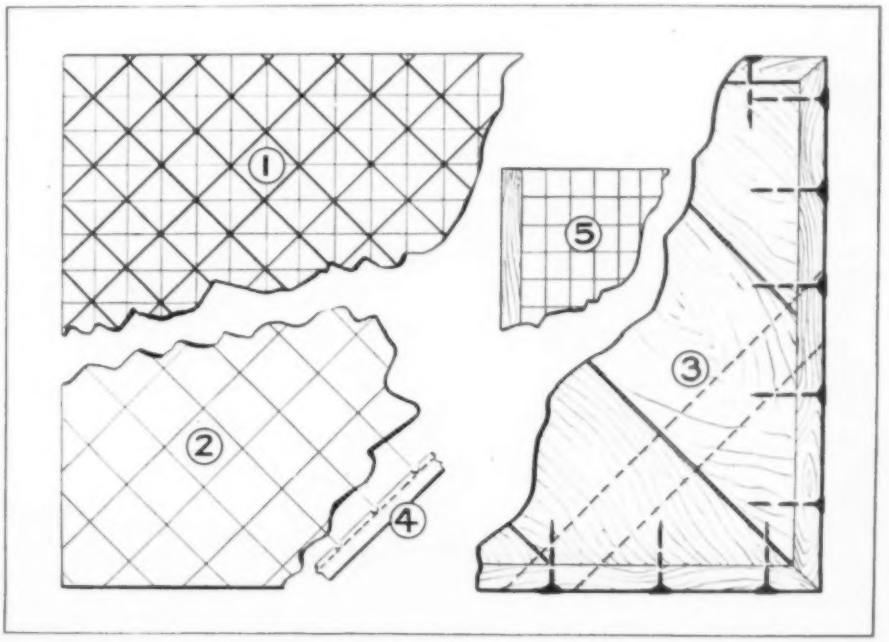
UNDER ordinary circumstances the attempt to make diamond floor plate patterns by hand is not advisable. This peculiar style of lumber, cut and ready to be assembled, can be supplied by any patternmaker's supply house. However, occasionally the patternmaker is called upon to make a diamond cut floor plate pattern. It is difficult and is not looked upon with any degree of favor by the ordinary patternmaker. The grooves are cut either by hand or with a plane provided with a cutter made for the purpose. As a rule patternmakers do not carry a plane of this character in their tool kits.

The question naturally arises whether a diamond design should be adhered to strictly even if it is specified on the drawing. A square or checkered design is comparatively easy to lay out and cut and a casting with grooves running at right angles fulfills its purpose as a floor plate just as satisfactorily as one in which the grooves are laid out in a series of diamonds. When a new pattern is wanted for a few repair plates and a supply of diamond lumber is not available I usually ignore the design on the drawing and make the pattern as shown in the broken section Fig. 2 in the accompanying illustration.

The grooves shown in Fig. 4, are cut with a round bottom plane usually to be found in every patternmaker's kit. In Fig. 5 the same kind of grooves are shown cut at right angles to each other and parallel with the sides. A section of a diamond cut floor plate pattern is shown in Fig. 1. A checker plate with the grooves cut at a 45-degree angle is shown in Fig. 2. How the lumber is cut and put together for Fig. 2 is shown in Fig. 3. Fig. 4 is a section through Fig. 2 and Fig. 5 is a right-angle checker plate.

In Fig. 5 the grooves are cut at right angles to each other and parallel with the sides of the plate. It is simple because the plane either cuts with the grain of the wood or straight across it. If an attempt was made to cut the grooves at a 45-degree angle one side of the plane would be cutting with the grain of the wood, clean and smooth, while the opposite side would be cutting against the grain and the result would be a ragged set of grooves.

To overcome this trouble the boards making up the pattern may be assembled as shown in Figs. 2 and 3. In this instance the ends of the boards are cut at a 45-degree angle and after the boards have been joined the grooves may be cut at a 45-degree angle with the sides and still run parallel with the grain of the wood or straight across it. When finished, the job presents workmanlike appearance.



CONSTRUCTION INDICATED IN FIG. 3 FACILITATES CUTTING THE GROOVES

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Contents

	Page
Small Shop Secures Low Costs	385
Carburize Synthetic Cast Iron	390
Explain Freak Grain Structure	394
Nonferrous Committee Discusses Alloys	395
Will Use Powdered Fuel	395
Passing of Industrial Depression Marked by Rochester Convention	396
Exhibits To Show Advance of Industry	407
Bill Is All Set for the Rochester Show	412
German Committee Makes Recommendations	414
Valve Firm Operates Four Shops—II	415
Considers Melting Nonferrous Alloys	418
How and Why in Brass Founding	419
Tough Aluminum Alloys	419
Making Molds for Lead	419
Zinc Must Be Kept Out of Babbitt Metal	419
Brass for Thin Castings	419
Melts Gray Iron Electrically	420
Looks Back on Fifty Years of Progress	421
Prepares Standards for Testing Coke	422
Production of Domestic Graphite Declines	422
Appoints Sales Agent	423
Checkered Floor Plate Made by Hand	423
Conventions Stimulate Industry	424
Trade Outlook in the Foundry Industry	425
Personal	426
Accord British Foundrymen Welcome	426
New England Association Hears Paper	426
Electrochemists Discuss Cast Iron	426
Obituary	427
Philadelphia Meeting	427
To Attend the A. F. A. Convention	427
Government Sells Many Surplus Materials	428
Controls Motor on Dust Arrester	428
Thermit Collar Permits Groove Inspection	428
Book Review	428
Equipment Demand Is Spotted	429
What the Foundries Are Doing	430
New Trade Publications	430

Conventions Stimulate Industry

CONVENTIONS primarily are designed as meeting places. A convention is an exchange where those who attend can secure a comprehensive grasp and experience a fairly universal outlook on what is going on in the particular industry in which they are interested. Correspondence, occasional personal contact, and the columns of the technical press all serve in their way and in varying degree to keep men posted on changes and innovations introduced in any industry in this swiftly moving generation. Neither one, nor all three, of the foregoing factors, can exert the same influence, or perhaps it would be more accurate to say, can exert an influence in the same manner, as a convention, particularly one conducted in the manner of the American Foundrymen's association in which an exhibition of foundry equipment and accessories is held in conjunction with technical sessions.

The average foundryman is not an ardent correspondent and does not exert himself unduly either in seeking or disseminating information touching on foundry practice, through the medium of long, and to him, tedious letters. Usually he is quite willing and competent to discuss his practice and his problems face to face with any other foundryman; but when it comes to going over the same, or similar ground, through the form of the written word, he considers it too much bother, shrugs his shoulders, and mentally decides that George is welcome to any honor or glory he may derive from shouldering the burden.

The element of personal contact is greatly limited in its scope and influence by the fact that the majority of foundrymen are closely held to one locality by the very nature of their business and therefore, although they realize the value of personal exchange of ideas, they have not the opportunity of exercising the privilege of larger acquaintance which would afford them a generous measure both of pleasure and profit.

The technical press probably has done more than any other single agency in promoting original research and in broadcasting the results of that research work, together with descriptions of methods and processes adopted by practical men for converting theoretical knowledge into plain workable, commercial practice. In many instances foundrymen fail to take full advantage of this available information. They are too busy, they have not the time to look through half of the magazines that come to their desks and as a result many of the things they should know, things they really would like to know, escape their attention.

A combined convention and exhibition presents the essence of the concentrated progress of the industry. Instead of one, the visitor will absorb information through all five senses and indeed, in many instances, the surrounding atmosphere and general influence has been known to act favorably on the sixth sense in influencing men to arrive at important decisions in the future conduct of their business. The intimate personal touch is there. He hears papers read and discussed by experts in their line and knotty points are cleared up in the discussion. He meets, sees, or hears, men prominent in the industry with whom he is familiar either personally or through reputation. Further, the many social features render the convention, a decidedly attractive affair and in the last analysis it must be admitted that any kind of knowledge or information is more easily absorbed when sugar coated.

Trade Outlook in the Foundry Industry

MAY has continued to make good on the promises of industrial improvement held forth in April. In the foundry industry no exception is noted. Plants have steadily improved their operations; orders are increasing; inquiries are more plentiful; except in the retail sales of every-day commodities, purchasing has been resumed in practically every line. Only one small cloud is noted in the business horizon. The coal strike remains unsettled, many large industries have not secured fuel for their immediate needs and inroads have been made on coal and coke stored in practically every locality.

Effect a Paradox

Up to the middle of May, the effect of the coal strike on industry has been contrary to all expected results. Fundamentally, the interruption of fuel output was expected to hamper practically all metal working lines. This in turn, it was thought, would limit demand, for semifinished products, bring lower prices and thus in the ultimate, stimulate business. On the contrary, production has not been hindered; higher prices have resulted and these very factors have served to spur operations in many lines. A notable example is in the output of pig iron. According to statistics, compiled by *The Iron Trade Review*, April showed a gain of approximately 35,000 tons over March, particularly significant when it is considered that the former was the shorter month. The daily average production of pig iron of all classes was at the rate of 69,008 tons for April as compared with 65,674 tons for March, giving a gain of 3334 tons per day and resulting in the highest average since January, 1921. The output of merchant iron totaled 360,014 tons in April, giving a loss of 30,629 tons compared with the previous month, and the daily average of 12,000 tons per day represented a loss of 601 tons. A net gain of six stacks is given, all in the nonmerchant class.

Prices of Raw Material for Foundry Use

CORRECTED TO MAY 11

Iron		Scrap	
No. 2 Foundry, Valley	$23.80	Heavy melting steel, Valley	$16.75 to 17.00
No. 2 Southern, Birmingham	17.50 to 18.00	Heavy melting steel, Pitts.	17.00 to 17.50
No. 2 Foundry, Chicago	22.00	Heavy melting steel, Chicago	15.25 to 15.75
No. 2 Foundry, Philadelphia	25.04 to 25.40	Stove plate, Chicago	16.25 to 16.75
No. 2 Foundry, Buffalo	22.00 to 23.00	No. 1 cast, Chicago	17.50 to 18.00
Basic, Valley	25.00	No. 1 cast, Philadelphia	18.00 to 19.00
Basic, Buffalo	23.00 to 23.50	No. 1 cast, Birmingham	13.00 to 14.00
Malleable, Chicago	22.00	No. 1 cast, Buffalo	18.00 to 18.50
Malleable, Buffalo	22.50 to 23.50	Car wheels, iron, Pittsburgh	16.50 to 17.00
Coke		Car wheels, iron, Chicago	19.50 to 20.00
Connellsville foundry, coke	$6.50 to 7.00	Railroad malleable, Chicago	17.00 to 17.50
Wise county foundry, coke	6.00 to 6.50	Agricultural mal., Chicago	17.00 to 17.50
		Railroad malleable, Buffalo	17.00 to 17.50

Auto Shops Full

In no single line has increased activity been more marked than in the automotive industries. According to the National Automobile Chamber of Commerce, reports from firms that produce 85 per cent of the country's total of motor cars indicate that April's production reached 213,000 passenger automobiles and trucks. This is second only to the record of March, 1920, when 220,000 vehicles were shipped. The improvement by no means has been limited to any one grade or price of automobile. Delivery dates have been set forward past July 1 by the majority of manufacturers in the Detroit district. One manufacturer of a passenger automobile in the $3000 class has increased from 1000 units a month to 1500 and expects soon, by adding to the working force to put out 2000 automobiles a month. The effect on the foundry industry has been immediate and marked. A foundry in Michigan, idle for almost a year received in one week orders for 400 cylinder blocks a day from one manufacturer and a blanket order for 5000 cylinders of another make to be shipped as soon as made. Tractor manufacturers are sharing in this general improvement.

All Factors Favorable

Other contributing agencies tend to support the general improvement in the foundry industry. During April, the railroads ordered over 31,500 cars, making a total of over 70,000 for the first four months of the year, which is nearly three times the entire number purchased during 1921. Orders recorded to date are at the rate of 210,000 cars a year. This has had a marked effect on both steel and malleable foundries, and together with the automobile demand has increased the operation in the latter branch of the foundry industry to over 50 per cent of capacity or about 65 per cent of normal. Nor is the improvement limited to any one branch of the castings industry or to any one locality. Foundry operations on the Pacific coast are said to be well above 40 per cent of normal. The New England district jobbing shops are exceedingly active, heavy hardware orders, some from export sources, have picked up until operations are on a par with 1913. Building construction continues to advance with a marked reflex upon the foundry branches. According to figures given by the United States Department of Commerce, bath tub orders received were increased from 49,134 in February to 63,815 in March; lavatory orders increased from 68,414 in February to 95,891 in March; and other sundries were proportionately on the up grade. No doubt with the steady advance in building incident to the season, these totals will be still further augmented in April statistics. Sanitary ware manufacturers have been strong buyers of pig iron during the first weeks of May. Other classes of iron foundries also have been buying in increased tonnages, and the one disturbing factor in the coal strike situation is the probable effect upon the foundry industry with fuller operations.

Nonferrous Brisk

Sales of metals to brass and aluminum foundries indicate increasing activity in castings demand. Nonferrous prices, based on New York quotations in the *Daily Metal Trade* of May 11, follow: Casting copper, 12.62½c; electrolytic copper, 13.12½c; Straits tin, 30.50c; antimony; 5.50c; lead, 5.37½c to 5.50c; aluminum, No. 12, producers' price, 19.00c to 19.20c and open market, 16.00c to 16.50c. Zinc is 5.05c to 5.10c, E. St. Louis. Average prices for April were as follows:

(New York Quotations)

Casting Copper	Electro. Copper	Lead	Tin Straits	Antimony	Aluminum 98-99	Zinc St. Louis
12.517	12.865	5.15	30.037	4.853	17.768	4.928

Personal

E. D. Blakely has resigned his position of superintendent, gas engine division, Worthington Pump & Machinery Corp., Cudahy, Wis.

H. C. Estep, European manager, THE FOUNDRY, has been elected a member of the council of the London branch of the Institution of British Foundrymen.

J. L. Battenfeld has been made field representative in Ohio, western New York and western Pennsylvania for the W. W. Sly Mfg. Co., Cleveland. He previously was connected with the U. S. Molding Machine Co., Cleveland.

Louis Resnick has resigned as editor of *National Safety News* and director of publicity for the National Safety Council to become editorial and publicity counselor with headquarters in New York. He has been succeeded by George Earl Wallis, at one time on the publication staff of the International Harvester Co.

F. J. Cook, past president of the Institution of British Foundrymen who arrived in New York on the Coronia, May 8, will present a paper at the Rochester convention of the American Foundrymen's association under the exchange arrangement existing between that society and the Institution of British Foundrymen. Previous to the Rochester meeting he contemplates a tour of the leading foundry centers of the East. Mr. Cook is vice president of the Staffordshire Iron & Steel Institute and is a partner in the firm of Rudge-Littley, Ltd., West Bromwich, Staffordshire, England, gray iron, malleable and brass founders.

Accord British Foundrymen Welcome

Oliver Stubbs, president of the Institution of British Foundrymen, Manchester, England and Thomas H. Firth, past president of that association, Sheffield, England, were entertained by the Pittsburgh Foundrymen's association on April 24, 25 and 26. Following plant visitations which included the Homestead works of the Carnegie Steel Co., the Mesta Machine Co., the Westinghouse Electric & Mfg. Co., the Union Steel Casting Co. and the Pittsburgh Rolls Corp., a banquet was tendered at the Duquesne club on the evening of April 25. A. L. Humphreys, president, Westinghouse Air Brake Co. and the Union Switch & Signal Co., presided. In an address following the banquet, Mr. Stubbs voiced the appreciation of his countrymen for the close co-operation and invaluable aid rendered by American foundrymen during the war. Mr. Firth explained in detail some of the underlying facts of present day problems in Great Britain. Others speakers included C. B. Connelley, labor commissioner of Pennsylvania; F. J. Lanahan, general manager, Fort Pitt Malleable Iron Co.; C. S. Koch, president, Fort Pitt Steel Casting Co., and C. C. Smith, chairman of the board of directors, Union Steel Castings Co.

On their arrivals in Cleveland, the distinguished British guests were met by a committee headed by Franklin G. Smith, president, Osborn Mfg. Co. Plant inspections included the Allyne-Ryan Foundry Co., Cleveland Co-operative Stove Co., Osborn Mfg. Co. and the National Malleable Castings Co. On Friday night, April 28, a testimonial dinner was tendered at the Union club by the Cleveland foundry and allied industries. John A. Penton, president, Penton Publishing Co., presided. F. A. Scott, vice president, Warner & Swasey Co. in an able address traced the development of Cleveland as a "hammer and tongs" center of industry. He welcomed the British visitors and expressed to them the respect and consideration of Cleveland manufacturers for the industrial accomplishments of their nation. Oliver Stubbs, in replying dwelt upon features which he had observed in American manufacturing practice, and submitted some new ideas on worldwide economic conditions. Other addresses were made by Ambros Swasey, president, Warner & Swasey Co. and F. H. Goff, president, Cleveland Trust Co.

Detroit and Chicago foundrymen and manufacturers entertained members of the British party during the first week of May. At a dinner given at the Detroit Athletic club, Monday, May 1, 35 representatives of the leading metal working industrial plants of Detroit and Southern Michigan were in attendance.

Chicago foundrymen in appreciation of their distinguished guests tendered a dinner at the Union League club Friday, May 5. C. R. Messinger, vice president, American Foundrymen's association presided. An address of welcome was delivered by John W. O'Leary, Chicago Trust Co. to which Mr. Stubbs, responded. Charles Piez, Link-Belt Co., Chicago, outlined some fundamental principals of industrial relations and related his experiences in connection with the Emergency Fleet Corp. during the war. Those present at the Chicago dinner included the following, representative of the foundry and allied industries of Chicago and vicinity:

C. R. Messinger, Chain Belt Co., Milwaukee; Charles Piez, Link-Belt Co.; John W. O'Leary, A. J. O'Leary & Sons, and Chicago Trust Co.; Major R. A. Bull, Electric Steel Foundries Research Group; J. H. Whiting, Whiting Corp., Harvey, Ill.; Col T. H. Hammond, Whiting Corp., Harvey, Ill.; Chris J. Wolff, president of American Foundrymen's association in 1906; S. T. Johnton, S. Obermayer Co.; William B. Greenlee, Greenlee Foundry Co.; J. C. O'Neill, Western Foundry Co.; J. B. Ryan, Western Foundry Co.; J. M. Taylor, secretary, National Founders association; J. W. Wolfe, secretary, Chicago Foundrymen's association; H. E. Bullock, Illinois Malleable Iron Co.; H. S. Simpson, National Engineering Co.; G. H. Manlove, Penton Publishing Co., and secretary Chicago Foundrymen's club; J. E. Schindler, Garden City Foundries, and president, Chicago Foundrymen's club, David McLain, McLain's System, Milwaukee; John L. Slivinski, International Harvester Co., Deering Works; C. P. Wright, American Brake Shoe Co.; E. O. Beardsley, Beardsley & Piper Co; and C. E. Hoyt, secretary, American Foundrymen's association.

After leaving Chicago the party visited Niagara Falls. The remaining time before sailing for England the end of May will be spent in New England and the coast cities.

New England Association Hears Paper

The New England Foundrymen's association held its regular May meeting at the Exchange Club, Boston, May 10. Henry Gieseke of the engineering department of the Ajax Metal Co., Philadelphia, presented the principal paper. His address dealt with the electric furnace for nonferrous melting. Mr. Gieseke discussed various phases of the melting of nonferrous metals, particularly the latest development in regard to melting by the electric induction furnace. He formerly was superintendent of the Bridgeport Brass Co., Bridgeport, Conn., and has had a wide experience in the nonferrous industry.

Electrochemists Discuss Cast Iron

One of the outstanding features on the program of the American Electrochemical society meeting, held in Baltimore on April 27, 28 and 29 was the conferring of honorary membership on Dr. Carl Hering, one of the founders of the society and a consistently ardent worker in its affairs, since its inauguration. Technical sessions were held in the mornings on mezzanine floor of the Emerson hotel, and the afternoons and evenings were given over to relaxation and entertainment.

At a symposium on electric cast iron presided over Thursday morning by Messrs Bradley Stoughton and A. T.

Hinckley, the following papers were presented:

Cast Iron as Produced in the Electric Furnace and Some of its Problems, by George K. Elliott.

Electric Cast Iron, by W. E. Moore.

Synthetic Cast Iron, by J. L. Cawthon.

Synthetic and Electric Pig Iron, by Robert Turnbull.

A study of Carburization in the Manufacture of Synthetic Cast Iron, by Clyde E. Williams and C. E. Sims.

Melting of Cast Iron in the Booth Rotating Electric Furnace, by H. M. Williams.

Electric Furnace Iron and Steel—Intermittent and Alternating Operations, by W. E. Cahill.

A Comparison between the Shaft and Open-Top Furnaces in the Manufacture of Pig Iron Electrically from Ore, by R. C. Gosrow.

The Electric Furnace in the Iron Foundry, by L. C. Judson and H. P. Martin.

Friday morning was given over to the annual business meeting including the election of officers. Atheson Smith, retiring president delivered an address on The Technical Man as a Citizen.

The following officers were elected for the coming year: President, C. G. Schluederberg, Westinghouse Electric & Mfg. Co., Pittsburgh,; vice presidents, H. C. Parmelee, editor *Chemical & Metallurgical Engineering*, New York; A. H. Hooker, Hooker Electrochemical Co., Niagara Falls, N. Y.; W. S. Landis, American Cyanamid Co., New York; treasurer, F. A. Lidbury, Oldbury Electrochemical Co., Niagara Falls, N. Y.; secretary, Colin G. Fink, 101 Park avenue, New York.

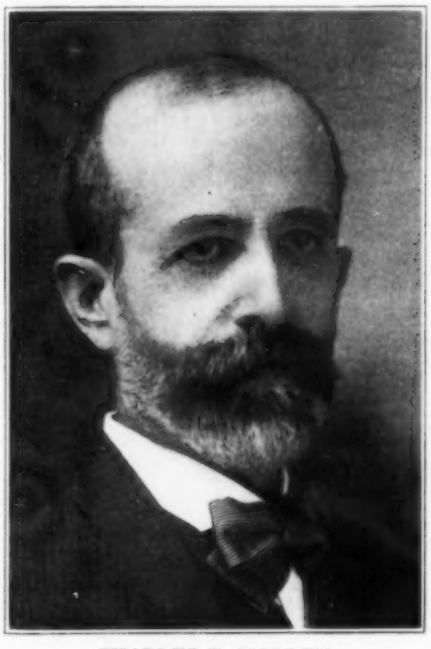
The electrothermic division of the society elected the following officers: Chairman, Bradley Stoughton, New York; vice chairman, John A. Matthews, Crucible Steel Co. of America, New York, and secretary-treasurer, Colin G. Fink. The directors elected are George K. Elliott, Lukenheimer Co., Cincinnati; J. H. Parker, Carpenter Steel Co., Wyomissing, Pa.; W. J. Priestley, U. S. Naval ordnance plant, South Charleston, W. Va.; D. A. Lyon, U. S. bureau of mines, Washington, D. C.

The fall meeting of the society will be held Sept. 21, 22, 23 in Montreal, Canada, with headquarters in the Windsor hotel.

The name of the Wayne Oil Tank & Pump Co. has been changed to the Wayne Tank & Pump Co., Fort Wayne, Ind. This firm manufactures oil and gasoline stove and pumping systems, oil burning equipment, etc.

Obituary

Charles F. Molley for the past seven years vice president and general manager, American Boron Products Co., Reading, Pa., died of pneumonia in St. Joseph's hospital, that city, on April 7 after an illness of seven days. He was born in Pine Grove, Schuylkill county, Pa., June 25, 1857. His father was a prominent contractor and built some of the first railroads in the coal regions of Pennsylvania and during the period of the civil war, owned and operated the Franklin



CHARLES F. MOLLEY

furnaces in the same state. The late Mr. Molley received his education and studied law in Germany. His first trip was made at the age of 15 when he remained abroad for a year. He returned at the age of 18 and remained for a period of four years and he also made a third and last trip in the fall of 1905. He first located in Reading in 1889 as a partner in the insurance firm of Molley, Smith & Co., but left the city after a short time to return again in 1895 as the leader in the development of Wyomissing, considered Reading's most beautiful suburb. From 1905 to 1915 he resided in Brooklyn, but on the latter date returned to Reading to take up the active management of the American Boron Products Co., now located at the former McQuade quarries property in West Reading. He maintained residences in both cities and only spent part of his time in Reading where the plant is under the direct supervision of his son Robert.

John Lauson, aged 54, president of the John Lauson Mfg. Co., New Holstein, Wis., died April 17 from the effects of an operation. At 19 Mr. Lauson opened a machine shop and later added a foundry, which he developed into the present large gas engine, tractor and farm power industry. His brother, Henry D. Lauson, is secretary and treasurer of the company.

John E. Davey, manager of the Manitoba Steel Foundries, Selkirk, Man., for the past four years, died recently from apoplexy. He was 51 years old. For a number of years he was connected with the Canadian Brakeshoe Co., Ltd., Sherbrooke, Que.

P. A. MaGirl, prominent foundryman of Bloomington, Ill., died at the Kelso sanitarium April 21. Born April 14, 1850, he accompanied his parents to Bloomington in 1854 and resided in that city ever since. He learned the molder's trade and in 1892 organized the firm of MaGirl & Diedrich to engage in the foundry business. In 1896 he bought his partner's interest and continued the business under the firm name of P. H. MaGirl Foundry & Furnace Works. The present plant on East Oakland avenue was built in 1904.

Philadelphia Meeting

The Philadelphia Foundrymen's association held its 317th meeting at the Manufacturers' club, Wednesday evening, May 10. W. W. Sanderson of the Carborundum Co., Niagara Falls, N. Y., presented a four-reel moving picture showing the growing electric possibilities of the Falls. Another speaker of the evening was J. L. Linsley, chairman of the National Association of Purchasing Agents.

To Attend the A. F. A. Convention

Special arrangements are being made by members of the Pittsburgh Foundrymen's association to attend the American Foundrymen's association convention at Rochester, N. Y., June 5-9. Identification certificates are being issued to members of the Pittsburgh body by the association whereby round trip tickets will be sold at the rate of one and one-half fare for the round trip.

The Mott Sand Blast Mfg. Co. has moved from its former location at 24 South Clinton street, Chicago, to a new plant at 3101-3111 West Twenty-seventh street, where it will have much better facilities for manufacturing. U. H. Dernehl is president.

Government Sells Many Surplus Materials

The extent to which this country was participating in the World war is indicated by the fact that up to March 1 the government had disposed of approximately a billion dollars worth of materials made surplus by the closing of the war. On that date there remained on hand and ready for sale property which represented an original cost to the government of $190,000,000 and new declarations of surplus are being made every day.

An idea of the variety of the surplus may be obtained from the following list of materials which the government is trying to sell: Electrical equipment, hand tools, hardware, lumber, chemicals, oils, metals, paints, engineering equipment, machine tools, clothing, textiles, airplanes and parts, scrap metal, cannister bodies, gas masks, wagons, railway material, railroad rolling stock, ships, barges, building material, land, buildings, food stuffs, leather, medical supplies, hospital supplies, laboratory supplies, greases, saddles, harness, etc.

Controls Motors on Dust Arrester

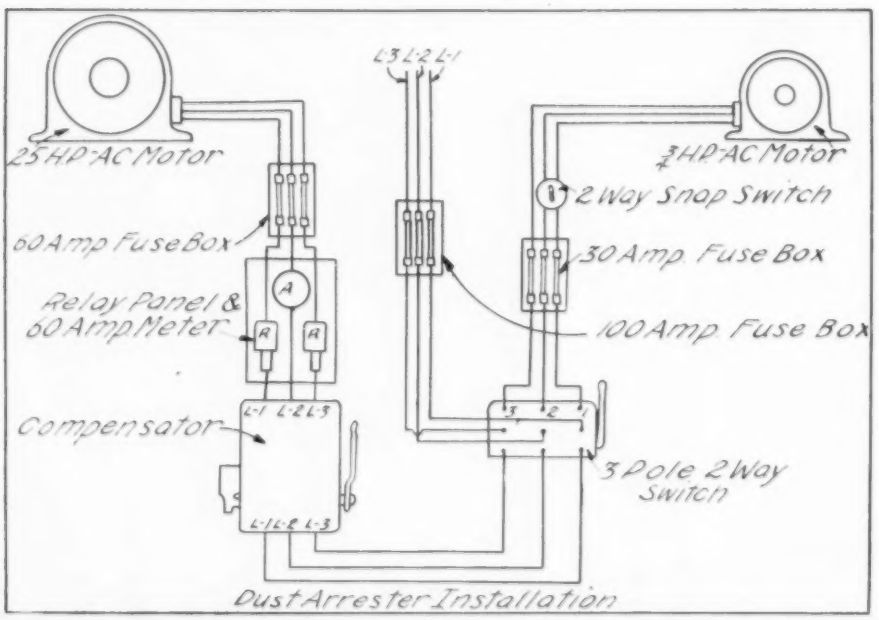
By E. J. Edwards

In many installations the dust arresters are located outside and the controllers located inside the buildings, rendering it difficult at times to determine whether the motors are running or not. Frequently the operator starts the exhaust motor while the shaker motor is running and sometimes the latter is left running for hours before it is noticed and shut off. This practice is injurious to the cloth screens. The motor operating the rapping or shaking device should be worked for 10 minutes twice a day, or in extreme instances a little longer, but only when the exhaust motor is shut down.

By connecting the motors as shown in the accompanying illustration the possibility of running both motors at the same time is prevented. The current comes in at the 100 ampere fuse box, then passes to the 3-pole 2-way oil switch. When this switch is thrown from the operator it is connected to the 30-ampere fuses and by turning the snap switch the shaker motor is started. After the shaker motor has been running for a sufficient length of time, the snap switch is turned and the 3-pole, 2-way oil switch is pulled toward the operator. This connects the line to the compensator which in turn is connected to the 25-horsepower exhaust motor. When this motor is stopped it only is necessary to trip the compensator and put the 3-pole, 2-way oil switch on the center or neutral position.

Thermit Collar Permits Groove Inspection

According to a statement made by the Metal & Thermit Corp., New York, the one fact that has been more responsible than any other for retarding the progress of welding, is that after a weld is made it is impossible to determine without destroying it what strength is definitely assured and safe to allow. An examination of the surface reveals nothing. It is on this account that technical societies interested in the possibilities of welding have restricted the allowable application. The collar which forms an integral part of a weld made by the thermit process provides a medium for careful inspection and permits the drawing of conclusions as to the strength of the weld. If the proper amount of thermit has been used and instructions followed it is impossible to have such defects as lack of fusion or oxide inclusions. Unclean surfaces, oxide inclusions, due for example, to failure to properly clean scale from wrought iron before welding, always have resulted in thermit welding in one kind of defect—blow holes. This defect, due to the natural tendency of the gas to rise in the molten mass, if present, always will show in the collar and an examination of the interior of the collar can be made without affecting the strength of the weld. Thus the unsound welds may be found and condemned. In practice the examination is made by gouging deep grooves in the steel collar parallel with the axis of the piece. The grooves may extend down almost to the original section. Two such grooves on each of the four sides of a weld should be sufficient. If the grooves are free and clean from blow hole defects the inspector may be assured that the weld itself is sound.



WITH THIS ARRANGEMENT OF ELECTRICAL CONNECTIONS THE RAPPING DEVICE MOTOR ONLY CAN BE OPERATED WHILE THE FAN MOTOR IS SHUT OFF AND VICE VERSA

Book Review

Aluminum and Its Alloys, by C. Grard; 184 pages, 5½ x 8½ inches; cloth; translated by C. M. Phillips and H. W. L. Phillips; published by D. Van Nostrand Co., New York, and for sale by THE FOUNDRY; price $5.00 postpaid.

To discuss the properties, thermal treatment and industrial applications of aluminum and aluminum alloys is the primary purpose of this book, the author of which is a lieutenant colonel of artillery in the French army. The ore from which aluminum is extracted is found in large quantities in France.

The volume is divided into Book I, and Book II, dealing with aluminum and aluminum alloys respectively. Book I is composed of Part I and Part II which have to do with the production of aluminum and the properties of aluminum. Book II is composed of Parts III, IV and V, and takes up light alloys for casting purposes, light alloys of great strength, and heavy alloys of great strength respectively. A number of illustrations are used including micrographs and charts. Considerable tabular matter is given, since a large number of tests has been made on each type of material. In particular, an exhaustive study has been carried out on the properties as functions of cold work and annealing, and on hardness at all temperatures.

Equipment Demand Is Spotted

Varied Sales Reported from Different Sections—Western Inquiry Continues To Improve in Step with More Active Foundry Operation—New Projects and Additions Scattered

DESPITE the steady improvement noted in foundry operations, the purchases of foundry equipment are irregular. Some sections, notably the Chicago district observe a heavier demand, and increasing sales are in prospect. Reluctance to buy is noted in the East, except in molding machines which are fairly active. George A. Reed & Son, Gloucester, Mass., iron and brass founders will construct an addition. The Fox Furnace Co., Elyria, O. has purchased a cupola from the Whiting Corp., Harvey, Ill.

Eastern Requirements Light

FOUNDRY equipment buying in the East continues restricted largely to replacement orders. Few new foundry projects are coming out and the situation appears to have changed but little within the past two weeks. In no case is any extensive buying noted. Several projects are contemplated for which equipment has been tentatively figured, but there are no signs of immediate action. The Wheeler Condenser & Engineering Co., Carteret, N. J., recently was contemplating the erection of a new foundry, but since has decided to make alterations to its present foundry instead. As the result of this change, the company has reduced an inquiry for two 20-ton electric cranes, with 60-foot span to one 20-ton crane with a 50-foot span, this business going to Pawling & Harnischfeger Co., Milwaukee. The company also contemplated the purchase of several cupolas, but it has temporarily withdrawn from the market. The National Foundry Co. of New York, Brooklyn, recently has closed on a sand cutter and is still figuring on a little additional equipment. Although the Advance Boiler Corp., Poughkeepsie, N. Y., is said to have closed on some equipment for its proposed new plant, this company is also still in the market. Interest is shown in the announcement that the Western Maryland railroad will build a new car repair works at Fort Covington, Baltimore, and that the Pennsylvania railroad will erect an extensive addition to its car repair shops at Altoona. However, it has not been definitely established as yet, that foundry equipment will be required. The Pennsylvania railroad has inquired tentatively on six 15-ton electric cranes with 97-foot span, for the proposed addition at Altoona. The New York Central railroad has not as yet come into the market for foundry equipment for its proposed West Albany, N. Y., development, although it is understood that the requirements will be substantial.

Quickening Noted in Chicago Market

FOUNDRY equipment selling has taken a decided forward step within the past fortnight and an unusual volume of business has been booked by supply houses and equipment makers in Chicago. New foundries and additions are being planned and equipment will be required to fit them for operation. The Whiting Corp. has taken a contract to furnish all the equipment for the new plant of the New York Car Wheel Co., Hammond, Ind. This will include casting pits, trucks, cupolas, ladles and all the incidentals necessary to put the foundry in condition for actual operation. This is a large contract and such an opportunity has not been given for some years. The Rundle Mfg. Co., Milwaukee, is building an addition 60 x 210 feet to include a cleaning room, 80 feet long, blacksmith shop 20 feet long and the remainder a pattern shop. Equipment for this addition will include a sand-blast room, tumbling barrels, flexible shaft grinders, floor and edge grinders. Equipment for the blacksmith shop already is provided. The new foundry of the Keith Furnace Co., Des Moines, Iowa, is under way and will be in the market shortly for a cupola, four tumbling barrels and necessary cranes. It will have a capacity of about 12 tons of iron per day. Both these projects are in the hands of the Kawin Co., Chicago. The Ford Motor Co. continues to add to its foundry equipment and has placed an order with the Whiting Corp. for twelve 2000-pound helical geared crane ladles. The same seller has taken an order for four 7500-pound helical geared ladles for Davies & Thomas, who have the contract for the New York vehicle tunnel segments. From the same maker the National Malleable Castings Co., Chicago, has bought a one-ton bracket crane, the Crane Co. has taken six 42 x 60-inch tumbling barrels and the Studebaker Corp. four 36 x 72-inch tumbling barrels. Demand for cranes is strong and considerable competition exists. Cupolas are in demand and one concern has shipped eight or ten to eastern users within a short time. With renewed activity on the part of foundries, demand for general foundry supplies is increasing.

Molding Machines Lead in Pittsburgh

ALTHOUGH suffering but slightly from the effects of the coal strike through curtailed coke production, foundries in the Pittsburgh district aim to have present equipment employed before adding much to the way of new. Users of castings apparently are even more hindered by the fuel shortage than makers, and accordingly are not ordering so heavily. However, basing their opinions on the extent of the inquiries before them sellers of foundry equipment are greatly encouraged over prospects. Sales of sand mixers, core ovens, tumbling barrels, etc., occasionally are made and in the past two or three weeks a fairly larger number of molding machines have been ordered by widely separated users. The Duquesne Steel Foundry Co., Pittsburgh, ordered two large rollover molding machines from the Herman Pneumatic Machine Co., and this seller among a number of other sales, disposed of one each similar in type, to the Burnham Boiler Co., Irvington, N. Y., and the Florence Pipe & Foundry Co., Florence, N. J. Several other foundries in this vicinity and at a distance are interested in this class of equipment as well as in sand sifting apparatus, core ovens, cupolas, etc. An inquiry or two involving sand machinery of various types gives promise of early closing. Flasks, wheelbarrows, etc., are moving with more or less regularity, although sellers state buyers are by no means over-anxious themselves to file orders. Flasks are ordered weekly or as business requiring special flasks

develops. As far as foundries are concerned, new inquiries for annealing or electric furnaces are negligible, although it is expected that after the coal strike is settled, some buying of this nature will ensue. The White Foundry Co., 613 Tenth avenue, Roanoke, Va., is in the market for a complete line of foundry machinery and foundry equipment for a small foundry. The Petersburg Farm Machine Corp., 1009 South Sycamore street, Petersburg, Va., is reported to be in the market for a complete line of machinery, foundry equipment and small supplies. Another prospective purchaser of foundry equipment is the Russell, Birdsall & Ward Bolt & Nut Co., Port Clinton, N. Y., which plans to erect a foundry at Coraopolis, Pa. Hoists and cranes still continue in popular favor with foundry operators and not a few are planning purchases. Sales of small hoists by the Shepard Electric Crane & Hoist Co., have been fairly numerous of late, some of which have gone into foundries, others to coal and other companies. The Fort Pitt Malleable Iron Co., Pittsburgh, recently closed on two 7½-ton Shaw cranes with Manning, Maxwell & Moore, Inc. The General Electric Co., Schenectady, N. Y. purchased two 25-ton cranes from the Northern Engineering Works, Detroit, which company likewise has sold a number of hoists in this territory. The Pawling & Harnischfeger Co. has just received an order for four cranes, two each 10 and 15-ton, and this is understood to come from the Lorain Steel Co., for its steel foundry at Johnstown, Pa. This crane builder likewise received an order recently for a 5-ton 56-foot span crane from the Oil Well Supply Co., Oil City, Pa. The Erie Foundry Co., Erie, Pa., recently was awarded a contract for a complete galvanizing equipment from the National Enameling & Stamping Co., St. Louis,

What the Foundries Are Doing

Activities of the Gray Iron, Malleable, Steel and Brass Shops

Erection of an addition, to be 100 x 100 feet, is reported to be under consideration by the Lavelle Foundry Co., Anderson, Ind.

A part of the plant of the Bibert, Vancroft & Ross Foundry & Machine Works, New Orleans, recently was damaged by fire.

Erection of an addition to its plant is planned by the Fox Furnace Co., Elyria, O., at an estimated cost of $14,000.

The plant of the Wanner Malleable Iron Works, Hammond, Ind., recently was damaged by fire.

The plant of the Victor Last Co., Lynn, Mass., manufacturer of iron shoe lasts, etc., recently was damaged by fire.

The Pacific Malleable Iron Co., Gresham, Oreg., is reported planning the erection of a foundry building.

The Service Foundry Co., Beaumont, Tex., is reported to have purchased a site on which it plans to erect a foundry and pattern shop.

Work will be started soon by the Sterling Stove Co., Portsmouth, O., on the erection of a foundry building.

The capital stock of the Winner Gas Stove Co., Huntington, W. Va., recently was increased from $50,000 to $150,000.

The capital stock of the B. M. Martin Brass Works, New York, recently was increased from $10,000 to $30,000.

The Belle Clair Foundry Co., Bellevue, Ill., recently was sold at foreclosure proceedings to Richard W. Hilgard.

The Commercial Steel Castings Co., Marion, O., has let the contract for the erection of an addition to its plant. Work on the addition will be started immediately.

The Reliance Foundry Co., Cincinnati, recently was incorporated under the laws of Ohio with a capital stock of $50,000, by Charles Ratley, Edwin D. Brooks and others.

The National Bronze & Aluminum Co., East Eighty-eighth and Laisy avenue, Cleveland, has been granted a permit to erect an addition to its plant at an estimated cost of $9000.

The Enterprise Foundry Co., 1400 Nixon street, Pittsburgh, is understood to be arranging for the installation of new equipment to replace that recently damaged by fire.

The R. & C. Lap Co., Davenport, Iowa, recently was incorporated with $100,000 capital stock to manufacture lap and expansion reamers and miscellaneous appliances and tools. It will also conduct a general foundry and machine shop business. The officers include: President, L. S. Rasmussen; vice president and treasurer, H. B. Carlson; secretary, A. M. York.

Capitalized at $75,000 the Republic Die Casting Co., New York, recently was incorporated by T. Powell, H. Davis and T. Hart. The company is represented by G. M. Sachs, 276 Fifth avenue, New York.

The stockholders of the United Roll & Foundry Co., Ravenna, O., are understood to have voted to sell the plant to the Ravenna Steel Co., which will manufacture steel reinforcing material for road construction work.

Cassidy Works, Ltd., Georgetown, Ont., has been incorporated to carry on business as a founder, machinist, etc., with $40,000 capital stock by Benjamin Luxemberg, Frederick C. Richardson and John R. Huffman.

The Arcade Malleable Iron Co., Worcester, Mass., plans the installation of new furnace equipment and additional facilities for the trimming and shipping departments. H. P. Blumenauer is vice president and general manager.

Capitalized at $500,000 the Buffalo Machine & Iron Corp., Buffalo, recently was incorporated to manufacture sugar mills and engines, by C. Baldy, J. F. Connelly and A. A. Williams. The company is represented by Kenefick, Cooke, Mitchell & Bass, attorneys, Buffalo.

Erection of a foundry building is planned by the White Foundry Co., Roanoke, Va. It is understood the plant will have an initial production of 5 tons of gray iron castings daily. Howard H. White, 613 Tenth avenue, Roanoke, Va., is president and general manager of the company.

Wettlaufer Bros., Ltd., 178 Spadina avenue, Toronto, Ont., has started work on the erection of a new foundry building at Mitchell, Ont., which will give 12,000 square feet of additional floor space to its present plant. New machinery will be installed but the company's requirements have not been made known yet.

The A. B. C. Pattern & Foundry Co., 4034 North Tripp avenue, Chicago, recently was incorporated with a capital stock of $20,000, to manufacture and deal in metal castings, patterns, etc., by Julius C. Hanson, Frank H. Sheridan and Irvin I. Livingston. Ryan, Condon & Livingston, 1600 First National Bank building, Chicago, represent the company.

A list of equipment for installation at its new plant, it is understood, is being arranged and will be issued shortly by the Crown Foundry Co., East Peoria, Ill., which was recently organized to manufacture castings.

Floor space containing 4500 square feet has been leased for a number of years at East Seventy-ninth street and Woodland avenue, Cleveland, by the Cox Brass Mfg. Co., which has a plant at 5601 Carnegie avenue, Cleveland. The leased quarters formerly were occupied by the National Bronze & Aluminum Foundry Co. The Cox company manufactures automobile bumpers, etc.

New Trade Publications

COMPRESSORS AND PUMPS—Air compressors and vacuum pumps are described and illustrated in a 16-page illustrated booklet recently published by the Pennsylvania Pump & Compressor Co., Easton, Pa. Both the compressors and pumps are of the straight line center crank type and are either power or steam driven. In the main these machines comprise a rigid frame, housing the driving parts, entirely enclosing them and providing a well for the continuous lubricating system. At one end are the crank shaft bearings, carrying the crank shaft and fly wheels. Other details of construction are given as well as specifications and other data of interest.

VALVES—An illustrated circular has been published by the Murphy Valve Co., Inc., Columbus, O., in which a globe valve is described and illustrated. According to the folder, instead of a bonnet on top of the valve, this valve has a cap on the bottom, which is easily removed and which permits of many advantages. When the valve is closed the pressure is confined in the lower half so that there is no pressure on the stuffing box. The disk and stem are cast in one piece making it impossible for the disk to become loosened on the stem. This valve can be opened at the drain cock and the pipe drained in both directions.